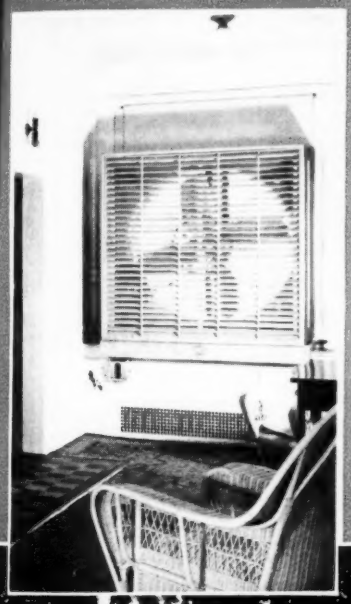
FEBRUARY, 1942

ELECTRICAL SOUTH

HUNTER, who has made fans and ventilators exclusively during 55 years, will continue to produce certain essential types for use by the various government agencies and private industries handling priority orders. ● Also, HUNTER will be able to furnish from present stocks a limited quantity of attic and commercial type ventilators for hotels, apartments, homes, stores, factories and any other location where night cooling fans should be employed to circulate fresh, outside air. ● *"The White House in Biloxi, Mississippi, has just installed HUNTER ZEPHAIR Cooling Units throughout the building.*



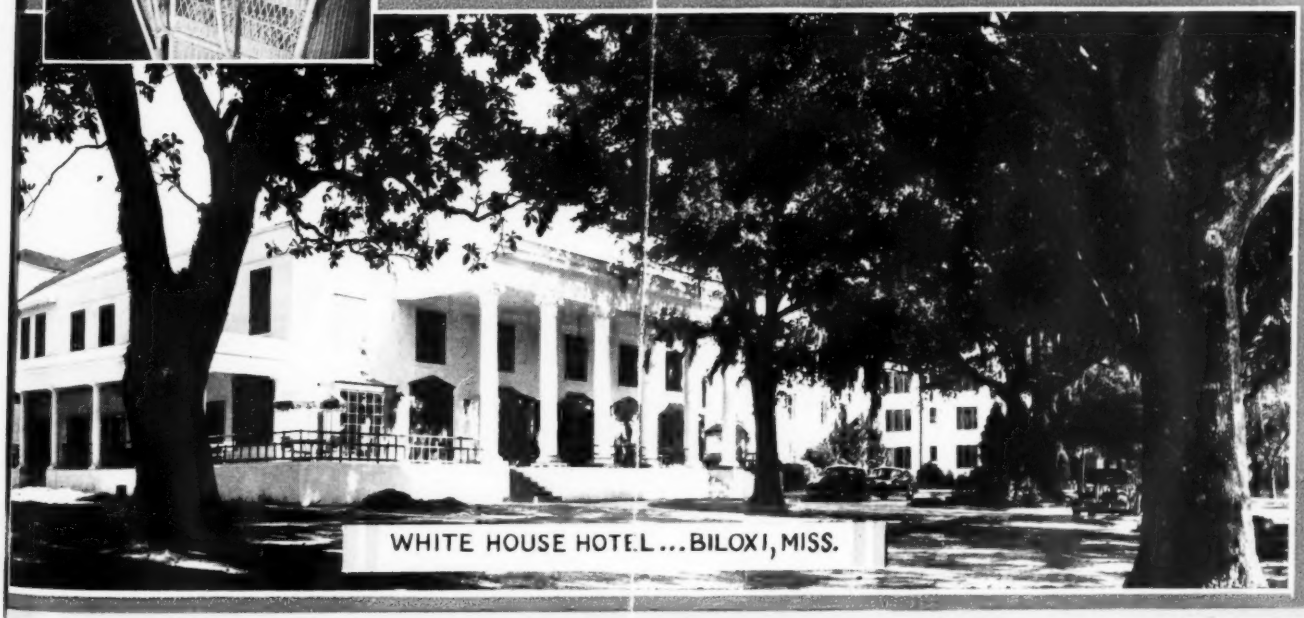
HUNTER FAN
& VENTILATING COMPANY, INC.

Factory: FULTON, N. Y.

General Sales Offices: Memphis, Sterick Bldg. *Eastern Sales Office:* New York, 92 Warren Street
Western Sales Office: St. Louis, 1804 Pine Street

Sales Offices:

ATLANTA CHICAGO DALLAS HOUSTON LOS ANGELES PHILADELPHIA
BOSTON CLEVELAND DETROIT KANSAS CITY NEW ORLEANS PITTSBURGH
ST. LOUIS



WHITE HOUSE HOTEL ... BILOXI, MISS.

If we're only 3/5 right

here's the best fluorescent buy

YOU'RE interested, we take it, in getting your client the most light for the least money in the long run.

We say Hygrade Fluorescent Lamps give you that for five reasons:

Because of finer coating texture, which you can see for yourself;

Because Hygrade Fluorescent Lamps give *more light*—more lumens per watt;

Because they are *more even in color*—every lamp alike, aiso obvious to the eye—and an assurance of uniformly high quality;

Because Hygrade lamps are *"bright to the last inch"*—early end-darkening no longer cuts down the light-casting length of the lamp;

Because Hygrade lamps *last longer;* tests show demonstrably more life than others; ask Hygrade users and see what they say.

If this were so on only three of these points, or even two, your customer will be money ahead, better off, because he'll get *more light and better light than he can get elsewhere.*

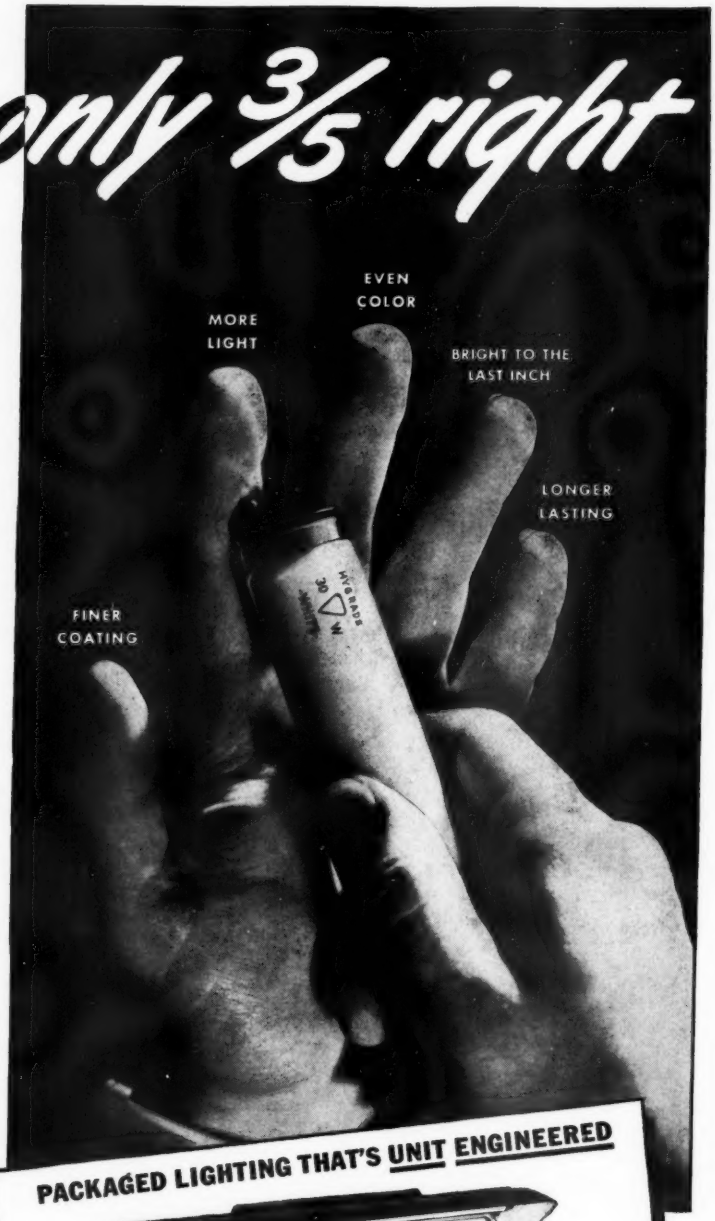
But plenty of Hygrade Fluorescent users say we're right on all five points.

Especially those using Hygrade Packaged Lighting—complete, guaranteed fixtures with all elements unit-engineered to work together—know the superior quality of Hygrade lighting.

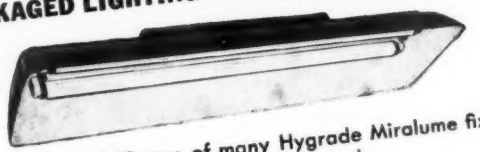
That is "fluorescent at its finest"—*better* lamps in *better* fixtures kept performing at their peak by *better* accessories.

So you'll find it pays to specify Hygrade when you recommend fluorescent lighting. Your client will be getting the best there is—and not a little of the credit will be reflected on you.

If you haven't yet received our free file-size kit—containing catalogs, prices and complete technical specifications on all Hygrade Fluorescent Lighting Equipment—write for it today. Dept. ES2.



PACKAGED LIGHTING THAT'S UNIT ENGINEERED



MIRALUME F-240, one of many Hygrade Miralume fixtures for every industrial need.

Good lamps are the heart of good fluorescent lighting. But good HYGRADE lamps are at their best in this Packaged Lighting that is *engineered as a unit.* Lamp, fixture, starter and ballast are designed and built *to work together,* all held to uniformly high standards—there are no "weak spots" anywhere to limit the performance of any part.

HYGRADE SYLVANIA CORPORATION

SALEM, MASS.

Also makers of Hygrade Incandescent Lamps and Sylvania Radio Tubes

Action ... in YOUR GREATEST RE-WIRING MARKET

FROM THESE SALES-MAKING HAZARD ADS

Building owners and managers all over the country take advantage of the news they've been waiting for... ADEQUATE WIRING AT A COST ALL CAN AFFORD with HAZAKROME Small Diameter Building Wire.

Specify HAZARD for NEW WIRING and REWIRING
CAN YOU ANSWER THIS QUIZ ON BUILDING PROFITS?
"Now, you can Afford to Rewire your Building."
HAZARD
Specify HAZARD for New Wiring and Rewiring
MODERNIZE BY REWIRING
MAKE SURE
Specify HAZARD

Reprints of trade paper advertisements directed to building owners and architects.

... It's Easy To See Why

When a man is in a bad hole...

like a manager or an owner of a building outdated because of inadequate wiring . . . and he cannot afford to tear out and replace the conduit.

And he's shown how to get out fast..

Same building owner reads these HAZAKROME ads . . . sees rewiring existing raceways lets him boost circuit capacity at half former cost

You can count on *ACTION*

There's another profitable rewiring job under way . .probably including branch circuit panels, service entrance equipment, lighting fixtures, etc.

Multiply This Man By The Thousands!

Actual surveys prove that the great majority of buildings throughout the country (last year it was 90%) can't possibly meet today's electrical demands without increasing circuit capacity. Think of this great rewiring market that is wide open to you . . . and what's more, already stirred to action. In just one city alone 23 office buildings have been rewired since this new method was introduced!

HAZARD INSULATED WIRE WORKS
Division of the Okonite Co.
Works: Wilkes-Barre, Pennsylvania
Offices in Principal Cities

TO GET YOUR FULL SHARE

Send for this fact-packed HAZAKROME HANDBOOK that gives you complete information about HAZAKROME Type SN Small Diameter Building Wire . . . tells clearly how to figure installations and capacities . . . gives you a tested program to sell more rewiring jobs. Just fill in and mail coupon below today.

Hazard Insulated Wire Works, Wilkes-Barre, Pa.

Please send me my copy of the Hazakrome Handbook.

NAME.....

ADDRESS.....

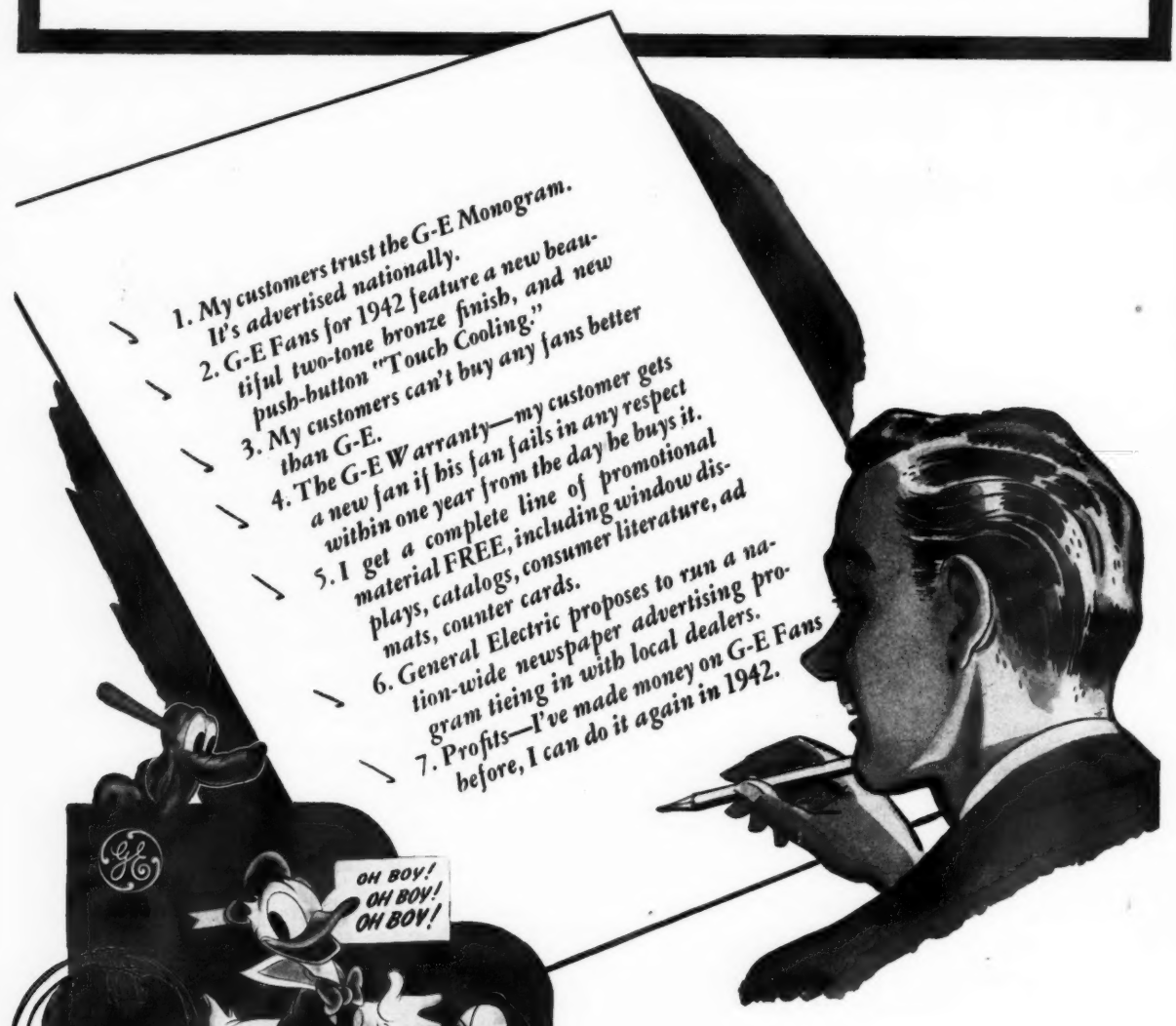
CITY.....

STATE.....

ELECTRICAL SOUTH is published monthly by W. R. C. Smith Publishing Co., Marietta, Ga., and Atlanta, Ga., U. S. A.
Subscription rates, United States and Possessions, $1.00 for one year; $2.00 for three years; Canada, $1.50 per year; Foreign Countries, $2.00 per year.
Entered as second class matter at the postoffice, Marietta, Ga., under Act of March 3, 1879.
Volume 22 Number 2

Why I'm Selling General Electric Fans in 1942

1. My customers trust the G-E Monogram.
2. It's advertised nationally.
3. G-E Fans for 1942 feature a new beautiful two-tone bronze finish, and new push-button "Touch Cooling."
4. My customers can't buy any fans better than G-E.
5. The G-E Warranty—my customer gets a new fan if his fan fails in any respect within one year from the day he buys it.
6. I get a complete line of promotional material FREE, including window display, catalogs, consumer literature, ad mats, counter cards.
7. General Electric proposes to run a nation-wide newspaper advertising program tieing in with local dealers.
8. Profits—I've made money on G-E Fans before, I can do it again in 1942.



The G-E Window Display for 1942—a full-color, action display motivated by G-E's most popular fan, the 10-inch styled Oscillating Fan, with the new Touch Cooling Push-Button!

GENERAL ELECTRIC

THE CONQUERING KILOWATTS

by Lowell Thomas

ONE of the absolutely prime requisites for national defense is *power*—power to put industry in high gear—power to do the almost inconceivable task that lies ahead. For power is the parent of every gun, every tank, every plane, every ship. It is truly America's first line of defense.

How *much* power can America produce?

It took a little digging on my part to discover that, right now, our power capacity exceeds that of Italy, Germany and Japan *combined*. Today we have fifty-five million kilowatts. Within another year American capacity will be at least sixty million kilowatts . . . sixty-four million by 1944.

Simple Terms

Those are big figures, but what do they mean, brought down to simple visual terms? Well, one kilowatt is the same as one and one-third horsepower. That means a single kilowatt has the working strength—the actual physical energy—of 14 strong men. On an efficient treadmill they would be able to lift 500 pounds one mile straight up in the air in an hour . . .

Now multiply those 14 husky men (equal to one kilowatt) by the more than 100 billion kilowatt hours that were sold by power companies last year and you would have power equivalent to more than *seven hundred million men*, working forty hours a week, fifty weeks a year!

Just look what that means! Seven hundred million of these mechanical workmen are enough to provide the equivalent of more than twenty workmen for every family in America . . . And you and the munitions factories can *get* those mechanical men to work at the snap of a switch! You have here, it seems to me, a beautiful example in strictly human, flesh-and-blood terms of what American power engineers have been able to do to reduce back-breaking toil—to make life more worth while for all of us—and to speed national defense production in our present emergency.

Power Enough Exists

The facts support our power company executives when they say we will have enough power to meet any immediately foreseeable demand.

"Okay," says the Man in the Street, "we've got enough kilowatts—millions more than Hitler has. But how do they compare to the requirements of defense plants, and can they keep our houses and stores lighted and run our non-defense factories at the same time?"

That was what I asked Colonel H. S. Bennion, Vice-President and Managing Director of the Edison Electric Institute, which is, among innumerable other activities, the central information bureau of the Power Industry.

"Speaking in general," said the Colonel, "there are plenty of kilowatts for every purpose at the present time, despite the heavy defense loads we have taken on.

"You see, the electric industry maintains in normal times a reserve generating capacity averaging about 35% over normal requirements. This is a reservoir of power that can be tapped to meet extraordinary needs.

"And there is still another reserve that can be utilized," Colonel Bennion continued. "The 'peak load' is sustained for only about four hours a day. The other twenty hours we operate at only 45% of total capacity. Merely by re-adjusting working hours in a certain percentage of factories, we could thus add another ten per cent to the juice available without switching in a reserve generator or using any of our reserve fuel."

"Have most of the additions in our power capacity been in Federal plants like T.V.A., Bonneville and Grand Coulee?" I queried.

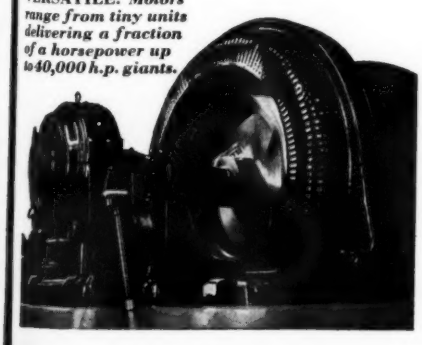
"No. Those are big plants and they're doing a swell job," the Colonel replied, "but it's our electric companies, operated under efficient American business management, who are responsible for carrying out the major part of our power preparedness program. All the Federal Government power plants together supply only a little more than 7% of the nation's power—municipal plants perhaps another 5%. The great majority of power is generated by privately owned and financed companies. Perhaps I should say publicly owned and financed, because their stockholders are numbered in millions."

That is the broad, general statistical background of Power in Defense. Adequate power now and expanding capacity for future needs.

Doers—not Talkers

Power men are all a good deal like the quiet, efficient mechanisms they tend and operate.

(*Continued on next page*)



VERSATILE! *Motors range from tiny units delivering a fraction of a horsepower up to 40,000 h.p. giants.*

NOTE TO READERS:

The article reprinted here appears, as Johns-Manville paid advertising, in the January 24th issue of the *Saturday Evening Post*. It is one of a series by well-known writers on the defense achievements of the major industries of the country.

Because of our long and close association with these industries, Johns-Manville knows, at first hand, the job which Industry is doing in arming our country. But we are convinced that too few people realize the magnitude of that job and, like other manufacturers, we believe it is vitally important that this story be told to the widest possible audience.

It is our sincere hope that this series in the *Saturday Evening Post* will be helpful in informing the public of the indispensable job American Industry is doing in this time of our greatest National Emergency.

Johns-Manville

This is the seventh of a series of advertisements sponsored and paid for by Johns-Manville. For more than 80 years this company has been serving America's basic industries.

How indispensable these industries are to the American Way in time of peace is generally recognized. This series is to help inform the public of the indispensable job these industries are doing in this time of great National Emergency.

Johns-Manville is proud of the contributions its products are making in helping the Electric Power Industry, as well as other industries, produce defense material quickly and at the lowest possible cost.

JOHNS-MANVILLE

THE CONQUERING KILOWATTS

(Continued from preceding page)

They function with little sound and no fury. And while they have plenty of imagination in doing their work, they don't allow themselves much in talking about it.

They'll tell you casually about spanning fifty or a hundred miles of wilderness with a 25,000-kilowatt line to a new training camp or an armament plant. But they won't speak of the eighteen-hour days of executives who don't get home to dinner once a week, of engineers whose cots are set up beside their drafting boards, of purchasing and material men who plead and wheedle to get supplies, and of surveyors, right-of-way men, diggers and bulldozers and foresters and linemen who clear the path for the power and erect the high voltage lines along which the kilowatts travel.

Keep 'em Marching!

"Our job is to maintain supply," said H. F. Smiddy, operating head of Electric Bond and Share Services, who was interviewed together with President F. W. Bird of Montana Power Company and Kinsey Robinson, President of Washington Waterpower.

"In other words," said Mr. Bird, "it's our job to keep the kilowatts marching and bring up the reserves as commanded." "And it is noteworthy," said Mr. Smiddy, "that it is the integration of corporate structures that has made possible the interconnection of once-scattered individual operating companies so that power can be spread or concentrated where and when it's required for defense."

"For example," said Kinsey Robinson, "an aluminum plant, which burns up more power than a city the size of Spokane, might be placed, for strategic reasons, in a district where the local power supply was inadequate. But through interconnected lines we could shunt enough power from the surplus of other companies in the system to wipe out the shortage."

"And if there isn't a line to that local plant," added Mr. Bird, "we string one, and the kilowatts get there. I don't know of an important instance in the whole electric network of the country where a power need for a defense plant hasn't been met on time or ahead of it."

Expansion—300%

Whether I talked with holding company heads or operating company executives, I got the same quietly confident story. I found reason for their confidence in the history of the power industry, which, in the characteristic American way, has expanded 300% in twenty years while the population has increased by but 25%.

Throughout the industry I sensed that a spirit of genuine, cheerful and competent co-operation with the government's all-out defense effort was universal.

I learned, from President E. L. Shea of the North American Company and a representative of American Gas and Electric, that electric expansion programs were begun as early as 1939 in anticipation of growing needs for national defense.

Foresightedly, the industry was mobilizing its kilowatts before the action started. What this means for production, and how promptly the kilowatts can be mustered, is illustrated by just one of the examples cited by President H. P. Liversidge of Philadelphia Electric.

"After nearly twenty years of idleness," said Mr. Liversidge, "Cramp's Philadelphia Shipyard prepared to re-open. The Manager phoned me, 'Can we have power in thirty days?' 'In thirty hours,' I told him, 'if you need it.'

"Perhaps it looked like a large gesture, but I was merely stating a fact. We've been able to take the job of powering a 50% increase in defense production in our stride. Bendix, Baldwin Locomotive Company (making heavy tanks), the Navy Yard, scores of factories making every variety of war machines and supplies—they've all had the power when they wanted it, they'll continue to have it for the duration."

—And that situation in the Philadelphia area isn't at all unique . . .

A hundred miles out of St. Louis the Army built Fort Leonard Wood, a camp housing 30,000 soldiers, eventually to hold 80,000. Power lines were run from Union Electric's system to the camp—far outside its territory—and the kilowatts marched in and kept the situation well in hand. Other Union Electric Company kilowatts in ample number were dispatched over other new lines to a T.N.T. plant at Weldon Springs, Missouri, and another munitions factory at Burlington, Iowa.

Down in Louisiana a camp for 40,000 men was laid out. The Army asked the Louisiana Power and Light Company for power in ninety days. Delivering that power meant 600 poles, 400,000 pounds of copper, thousands of insulators, hundreds of transformers, and two complete substations. It meant slashing the right of way through brush, swamps and forests. But the kilowatts marched in—in 75 days!

These operating electric companies in an interconnected system cover the country with a vast network. And from Houston to Boston, Jacksonville to Chicago, and San Diego to Seattle, the power needed in any particular spot has been delivered. Power, you see, is as vital to a nation's military production as is blood in your veins. A country can have men and materials (muscle and bone), but it can't produce planes and tanks without the lifeblood of power. That's why, so often, you read about bombing attacks on power plants in Germany, Occupied France and Italy . . . That's why, when they had to retreat from the Dnieper River, the Russians blew up their beloved Dnieperstroy Dam. Power means production. Production—enough of it in time—means invincible military strength.

EFFICIENCY. ***Research has achieved 300% increase in power output from steam-generated electric plants with no increase in fuel consumption!***

In America all our defense demand, up to now, has been superimposed upon the normal, non-defense requirements of light and power. Utility men say that defense production can be greatly increased and still be handled without cutting the householder's lights or power for luxury items. But they foresee—and business indices already indicate—that defense production is bound to cut into non-defense work, which will lessen the civilian and commercial demand for current. This means that the strain on power resources will be in that degree lessened. "Either way," said a power engineer, "the conquering kilowatts will march on."

For this quiet certainty that power will be adequate, the equipment companies are also responsible. They have accomplished literal miracles in supplying the tools of power production. And along with this job for the utilities, the electric powering of battleships, cruisers, airplane carriers for the Navy and the electrification of merchant ships has been increased and speeded to a degree where only "miracle" is the word.

If anybody wants to call me over-optimistic and over-enthusiastic about America's power plant, that's their good American right of free speech. But I believe that the hardest boiled cynic, or even the dourest defeatist, confronted with the facts as I have found them, would have to concede that the intelligence, energy and daring of private industry are doing a dynamic job of power production.

Built the American Way

Here is an industry that was really ready for national defense. Electric power is now driving 86% of the factory wheels of America. And almost nine-tenths of this vast power mechanism was built and operated by private enterprise, seeking an opportunity for profit, in the matchless American Way. In that search were developed new uses and new markets for power, new comforts and standards of living for Americans, at ever higher efficiency and with ever lower cost. Backed by the savings of millions of small investors, private industry has marshalled the peacetime kilowatt forces into an army more than adequate to America's production needs in a wartime emergency.

If the outcome of our battle for Democracy depends on power (and many believe it does) the kilowatts are already becoming Conquering Kilowatts in the service of Uncle Sam. And, as far as I can see into the future, they will *continue* their forward march until that final day when the Conquering Kilowatts of Democracy will light the blazing splendor of our Victory Parade.

This is the seventh of a series of advertisements sponsored and paid for by Johns-Manville and designed to tell the American people how indispensable our basic industries are for National Defense.

— JOHNS-MANVILLE —

Switch to Safety

and assure trouble-free operation with the new

(FA) SHUTLBRAK SWITCH

For motor circuits, service entrance, or any installation requiring an operating switch.

Type A, in ON position; door interlocked with handle — fuses not accessible when ON.

This heavy duty industrial switch embodies entirely new *ideas* in design and construction.

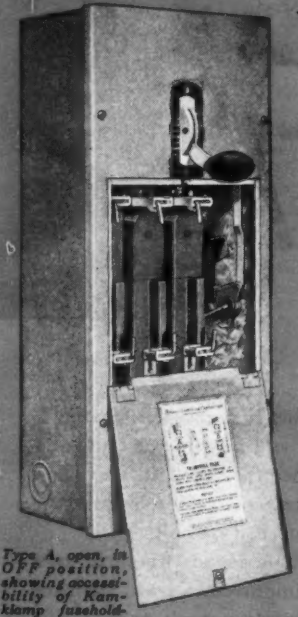
THE roller type main contact and auxiliary contacts are enclosed in an insulated shuttle. This shuttle assembly in turn is entirely surrounded by insulating material. There is an arc resisting barrier *at all times* between the line and load contacts — and contacts are *held under compression* in ON position. Silver plated current carrying parts insure low resistance. Properly engineered springs assure quick make and quick break.

As an additional safety factor, Type A is equipped with an interlocking arrangement between the operating switch lever and the door of the fuse compartment. The door *cannot be opened* when the handle is in the ON position. (Type B does not have this interlocking feature).

Enclosures have ample wiring space at top, bottom and *at rear* of the switching mechanism. Attractively finished in pearl grey enamel.

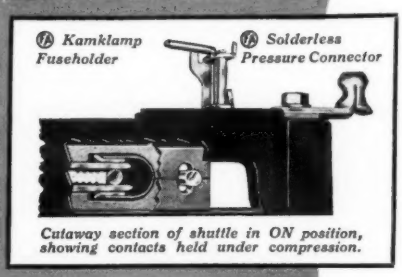
Front operated, the (FA) Shutlbrak Switch may be used singly, banked in groups, or assembled in compact, well designed switchboards and panelboards. Equipped with (FA) Kamklamp (pressure type) fuseholders for either ferrule or knife-blade types of fuse terminals. Also the new (FA) Solderless Type, Pressure Connectors.

Capacities at present: 30 to 400 amp., inclusive, for 250 volts AC or DC, and 575 volts AC, in 2, 3 and 4 poles. (Larger capacities in preparation). Approved by Underwriters' Laboratories as an Enclosed Switch.



Type A, open, in OFF position, showing accessibility of Kamklamp fuseholders.

For detailed information, and suggested specifications for Shutlbrak Switches, Panelboards and Switchboards, write for Bulletin No. 59 . . . Frank Adam Electric Company, St. Louis, Mo.



Cutaway section of shuttle in ON position, showing contacts held under compression.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank (FA) Adam

ELECTRICAL PRODUCTS

For Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

There is no unguarded moment in Anaconda's "control" research; the war program and our industry can thus count on the uniform dependability in every Anaconda wire and cable.

KEEN-MINDED technicians peer intently into metallographic microscopes, day in and day out, watching, watching to see that flawless metals go into every Anaconda wire and cable that is delivered to war-vital work.

Unceasing control like this has earned its "keep". For, throughout industry and now in the army and the navy, users have learned they can lean heavily on the dependability of wires and cables bearing the Anaconda trade-mark. And that isn't all.

They have recognized Anaconda research as a source for many product improvements and for many completely new developments . . . such as Type CB* construction that outlasts ordinary shielded paper-lead cable three to one. This research is a boon to our war effort . . . it will be equally valuable to industry with the return of peace.

*CB—Trade-mark Reg. U. S. Pat. Off. 42242

ANACONDA
from mine to consumer

This familiar trade-mark symbolizes the best efforts of modern research and production.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

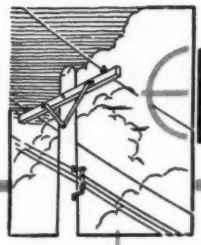
ANACONDA WIRE & CABLE COMPANY

Subsidiary of Anaconda Copper Mining Company

GENERAL OFFICES: 25 Broadway, New York City • CHICAGO OFFICE: 20 North Wacker Drive • Sales Offices in Principal Cities

FEBRUARY
1942

Volume 22 No. 2



ELECTRICAL SOUTH

J. C. MARTIN,
Manager

RICHARD P. SMITH,
Promotion Manager

W. E. COOGLER,
Production Manager

Editorial and Business Offices

GRANT BUILDING
ATLANTA, GEORGIA

Member of A. B. P.
Member of A. B. C.

ANNUAL SUBSCRIPTION—$1.00
THREE YEARS—$2.00
CANADA—$1.50; FOREIGN—$2.00

Business Representatives:
L. E. ALLEN, 189 West Madison St., Chicago, Ill. Tel.: Lakeview 10282.
L. R. MCCARTY, 325 Winding Way, Merion, Pa. Tel.: Merion 1066.
W. A. MCGEE, P. O. Box 562, Charlotte, N. C. Tel.: 3-4932.

Published Monthly by

W. R. C. SMITH
PUBLISHING CO.

Marietta and Atlanta, Ga.

W. J. ROOKE, *President*,
T. W. MCALLISTER, *Vice-President and Editorial Director*,
E. W. O'BRIEN, *Vice-President*,
R. W. PHILIP, *Vice-President*,
RICHARD P. SMITH, *Vice-President*,
O. A. SHARPLESS, *Treasurer*,
J. C. MARTIN, *Secretary*,
E. L. PHILPOT, *Asst. Secretary and Treasurer*.

Publishers Also of
COTTON
SOUTHERN HARDWARE
SOUTHERN AUTOMOTIVE JOURNAL
SOUTHERN POWER AND INDUSTRY

T. W. McALLISTER, Editorial Director CARL W. EVANS, Editor

NAT M. JOHNSON, Southwestern Editor

Contents

Load-Center Distribution for Industrial Plants	9
"Lines of Light" for Industrial Installations	13
Industrial Wiring Practice—Part 2	14
Utility Finances Rewiring for Adequacy	17
Defend Your Business with Better Management—Part 3	18
Prismatic Fixtures and Spotlights Feature Relighting	20
Rural Inspections Lead to Uniform Practices	22
Shifting Appliance Repairs to Electrical Dealers	24
"Using Users" Sells Fans without Trial Demonstrations	26
Dealers Face New Conditions with Merchandise Diversity	28

Departments

Practical Helps for the Trade	30
Industrial Electrification	34
News of the Industry	38
Personal Notes About Men You Know	48
New Equipment and Materials	52

Copyrighted 1942, W. R. C. Smith Publishing Co., Atlanta, Ga.

Entered as second class matter at Marietta, Ga., U. S. A., under Act of March 3, 1879.

"No Blink"

Says the Wise Old Owl

when YOU use Lloyd's *New* No Blink Starters

Lloyd leads again! The last word in "no-blink" starter construction! Has the rigid glass stem assembly that insures perfect alignment of parts and perfect operation. Combines with it a "long-life" automatic thermal switch which opens the circuit if a lamp fails to light. Absolutely stops blinking and flickering of lamps which have gone bad. Interchangeable with FS-4 for use with 40-watt lamps only.

Lloyd Policy Insures Quality

LLOYD PRODUCTS COMPANY

Box C, Edgewood Station **Providence, R. I.**

Representatives, Branch Offices and Warehouses in 22 Leading Cities

Lloyd Twist Type Lamp Holder with Starter Socket Blk. Cat. 353 Wht. Cat. 353-W Combined with Starter Socket Cat. 252 Pats. Pend.

Lloyd Starters

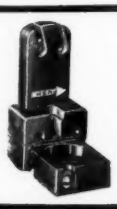
FS-2
15-W 18" lamps
20-W 24" lamps

FS-4
30-W 36" lamps
40-W 48" lamps

FS-6 100-watt

Lloyd Starter Socket with "Lobster Claw" Dual Lock

Blk.Cat. 252 Pat. Pend.



Lloyd Push Type Lamp Holder with Starter Socket Blk. Cat. 253 Wht. Cat. 253-W Combined with Starter Socket Cat. 252 Pats. Pend.

ELECTRICAL SOUTH

FEBRUARY, 1942

LOAD-CENTER DISTRIBUTION FOR INDUSTRIAL APPLICATIONS

The new load-center unit substations, an extension of well-known utility distribution practice, bring many advantages to industrial plant installations.

THE RELATIVE advantages of distributed load center types of distribution for industrial plants as compared to conventional radial systems with a single large substation were discussed comprehensively in a paper entitled "Fundamentals of Industrial Distribution Systems," presented at the AIEE Winter Convention, in New York City, in January, by D. L. Beeman and R. H. Kaufmann, both of the Industrial Engineering Department, General Electric Company.

The comparative merits of typical forms of industrial plant electrical distribution systems were evaluated by the authors of the paper on a basis of first cost, safety, service reliability, simplicity of operation, voltage regulation, efficiency, maintenance cost, and flexibility in meeting load changes. The highlights of this timely paper are reviewed briefly in the following paragraphs.

In the past, it has been common practice to distribute power to a relatively large factory area at utilization voltage from a single step-down sub-station accommodating several thousand kva. This will be referred to as the conventional method, a typical circuit diagram of which is illustrated in Figure 1.

The modern load center distribution method incorporates distributed step-down stations of small capacity (600-1,000 kva for 440 volt operation and 300-600 kva for 208Y/120 or 220 volt operation) from which low tension power is distributed to the immediately surrounding area as shown in Figure 2. A load center unit is defined as an integrated step-down station consolidating step-down transformer, high tension switching unit, and low tension switching equipment. Application of the distributed load center system not only allows a substantial reduction in total system investment cost, but also provides numerous other advantages.

The distributed load center system shows a lower installed cost than the conventional system because:

1. Power is transmitted directly to the utilization area at high voltage. This materially reduces cable investment cost and total I^2R losses.

2. The cost of low tension switching equipment is materially less than for the conventional method because of lower short-

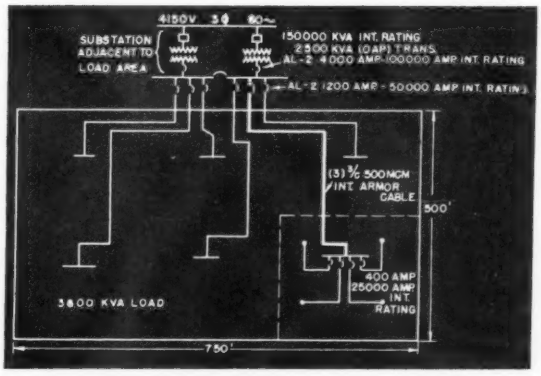

4150V. 3Φ 60~
SUBSTATION ADJACENT TO LOAD AREA
150000 KVA INT. RATING
2500 KVA (OAP) TRANS.
AL-2 4000 AMP-100000 AMP INT. RATING
AL-2 1200 AMP - 50000 AMP INT. RATING
(3) 3/c 500MCM /INT. ARMOR CABLE
500'
400 AMP 25000 AMP INT. RATING
3600 KVA LOAD
750'

Fig. 1. Schematic diagram of conventional industrial plant distribution system.

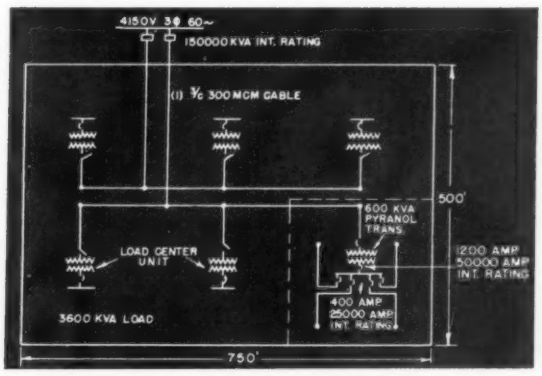


Fig. 2. Schematic diagram of typical load center distribution system for an industrial plant.

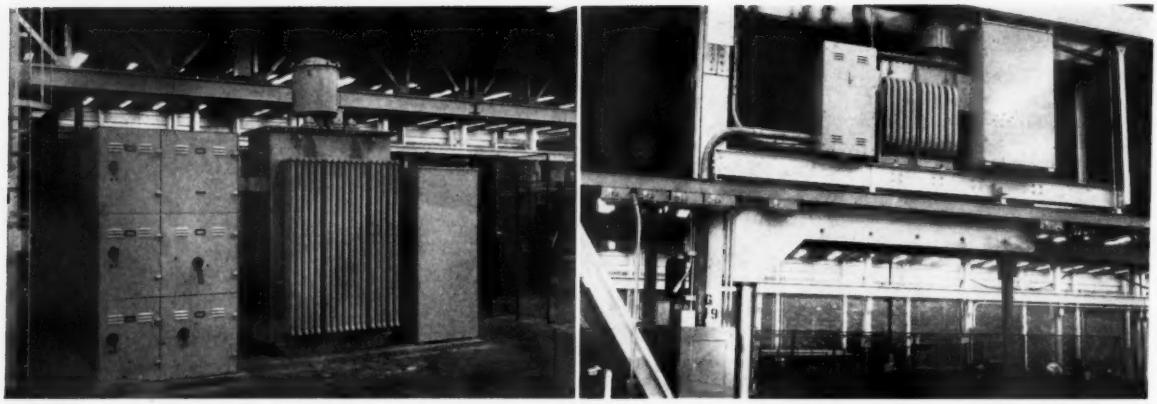


Fig. 3. These are typical installations of load-center unit substations in industrial plants. At left, a 1000-kva unit placed against a wall. The primary switching equipment is in the cubicle at right of the transformer while the 480-volt feeder draw-out-type circuit breakers are mounted in the compartments on the left. The photo at right shows how small 100-kva, 120/208 volt lighting units were tucked away using ceiling space instead of floor space. In this instance the circuit breakers are electrically operated from control points near the floor.

circuit currents associated with the smaller sub-stations.

Although transformer cost per kva diminishes with increasing rating, this influence is far overshadowed by the cost reductions enumerated for ratings of 600-1,000 kva at 440 volts and 300-600 kva at 220 volts.

For example, the installed cost of these two systems, based on the reference load block of 3750 kva, would be about $71,000 for the distributed load center system, compared with about $103,000 for the large single sub-station type.

Reductions in secondary cable and secondary switching equipment costs for the distributed load center system overshadow the increase in transformer cost. The necessity of simultaneous recognition of all system parts for determining the lowest overall first cost is evident.

The use of small load center sub-stations permits electrical capacity to be added in small increments when and where needed, thus large capital layouts are not required making it easier to finance plant extension. This eliminates the necessity for involved planning; hence, reduces engineering costs and errors. On the other hand, large substations require involved forecasting of location and magnitude of loads and high initial investment which is not completely put to work until the anticipated load is reached. If future developments do not permit utilizing the capacity of the large substation as planned, then the initial investment is not utilized efficiently or effectively.

A spare transformer for the small load center unit represents less idle capital than the larger spare unit for the large station.

The small substations compared with large ones offer many advantages from the standpoint of handling and installation. For example, (1) no expensive enclosures or foundations are required; (2) the small self-contained metal-enclosed load center unit can be located within the working area close to the center of the particular load area being served; while the large substation must generally be located at one side of the working area because of size and weight of component parts to be handled; (3) they can be moved more easily from one location to another to cope with changes in electrical demands accompanying changes in manufacturing technique; (4) in the event of a failure, service can be restored more quickly because less time and equipment is required to move the small units. The change can usually be made with equipment and personnel normally available around the average factory.

These advantages are only fully realized with completely metal-enclosed unit type substations as

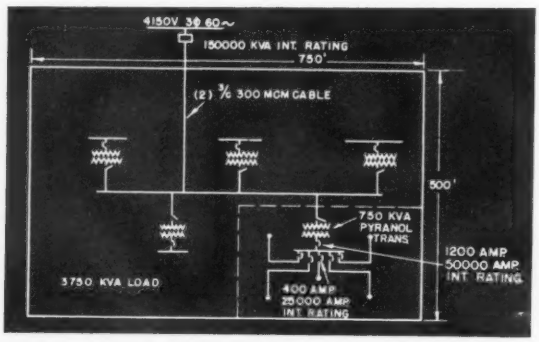


Fig. 4. Schematic diagram of simple radial circuit arrangement for a load-center system.

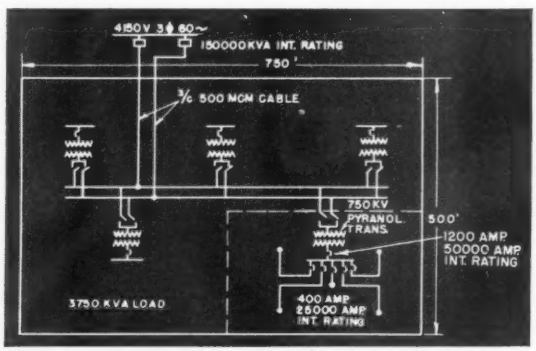


Fig. 5. This diagram shows a variation of the load-center system with primary selective circuit scheme.

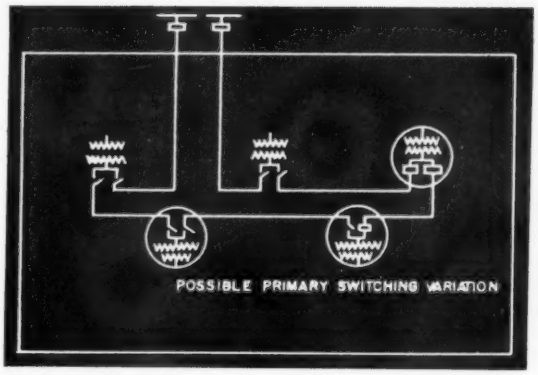


Fig. 6. Another primary selective circuit arrangement with loop primary feeder. (Above).

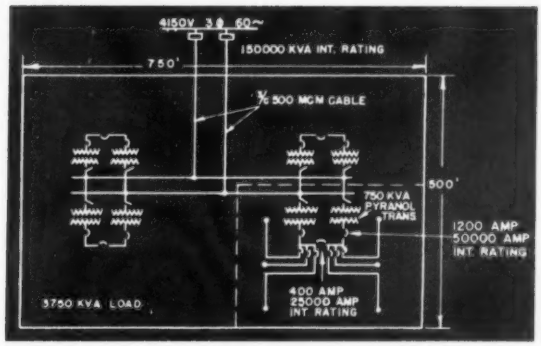


Fig. 7. This arrangement of load-center system provides for secondary selective circuit. (Upper Right).

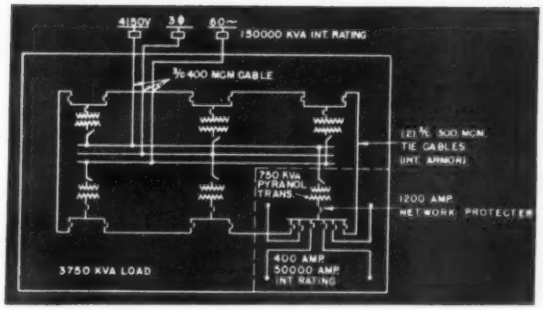

4150V 3 Ø 60~
150000 KVA INT. RATING
(2) 500 MCM TIE CABLES (INT. ARMOR)
750 KVA PYRANOL TRANS.
1200 AMP NETWORK PROTECTER
3750 KVA LOAD
400 AMP 50000 AMP INT. RATING

Fig. 8. Schematic diagram of secondary network arrangement of load-center system. (Right).

shown in Figure 3.

Because of the shorter secondary runs in load center distribution, voltage drop and light flicker are less. This improves the performance of motors and lamps, and hence facilitates more and better production.

Load center distribution is ideally adapted to industrial plants because it may be used in various circuit arrangements to meet varying degrees of service continuity required by manufacturing processes and because small units are used, variation may be adapted within small factories.

This comparison indicates that the load center distribution system is easily the most desirable for the average industrial plants. The single large substation design is not only more costly, but is deficient in other important respects, such as electrical operating efficiency, voltage regulation, greater initial engineering and planning, higher financing cost, and less flexibility as to future expansion or extensions.

Variations Possible In Circuit Arrangements

The principal reason for considering variations in circuit arrangements is that of service reliability. The various arrangements may be classified into four groups typified by forms 1, 2, 3 and 4 which provide progressively increased service reliability and may be individually characterized as follows:

All percentage cost figures are based on the typical example previously defined.

Type 1—Simple Radial (Fig. 4) This arrangement represents the simplest form of load center distribution and provides a single direct electrical channel extending to each low tension load area. All system elements are considered to be operated at rated capacity.

The lowest possible installed cost is obtained due to simplicity of the arrangement and complete absence of secondary power supply duplication, together with selection of the optimum size of load center unit. For cost comparison, this arrangement will be arbitrarily assigned a value of 100%.

The inherent simplicity together with circuit breakers of adequate interrupting capacity results in a high order of safety. The load center unit substation primary disconnecting switches are for isolating a load center unit only when completely deenergized.

All load to a particular area is always delivered by way of a single well defined route which makes for simplicity in operation.

Voltage regulation is only slightly inferior to the best circuit arrangement considered, the difference being due to normally operating all transformers and cable at full rated capacity.

Service reliability of this arrangement is not the best for a failure of the primary cable or its associated junctions interrupts power flow to the entire load block pending repair or installation of a temporary high tension circuit in place of the faulty section. A failure of a load center transformer or its associated connections results in an interruption of power to that local area pending repair or replacement of the faulty unit. To deenergize one element for inspection or maintenance (i.e. primary feeder breaker, load center transformer or high tension disconnect switch) likewise demands interruption of power flow.

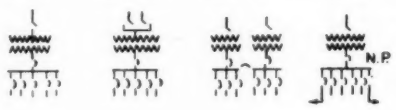
In the great majority of applications, a higher degree of service reliability will be warranted.

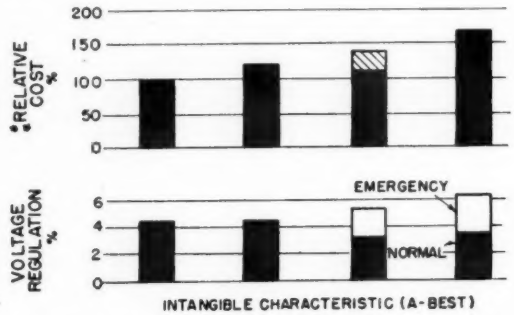
Type 2—Primary Selective (Fig. 5.)—As will be observed from the figure, this circuit arrangement is distinguished by the use of duplicate primary high tension feeders, either of which is capable of handling the entire load block, in combination with a high tension transfer means at load centers.

Under normal operating conditions, approximately equal numbers of load center unit substations are fed from each primary cable. While operating normally in this condition, operating characteristics are practically the same as the Type 1.

The presence of the primary transfer means makes it possible

TABLE I
RELATIVE PERFORMANCE CHARACTERISTICS
LOAD CENTER DISTRIBUTION SYSTEM DESIGN

	NO. 1 SIMPLE RADIAL (FIG 4)	NO. 2 PRIMARY SELECTIVE (FIG 5)	NO. 3 SECONDARY SELECTIVE (FIG 7)	NO. 4 NETWORK (FIG 8)
LOAD CENTER UNIT DETAIL				
TRANSF. L.T. CIR. BRKER	AL-21200A (50000 IC)			1200A NET PROT.
FEEDER CIR. BRKER RATING	AE-18 400A (25000 IC)			AL-24 00A (50000 IC)
TOTAL NO. FEEDER CIR. BRKERS	25	25	24	24
LOAD CENTER UNITS NO.	5	5	4	6
UNIT TRANSF. KVA	750	750	750	750
TOTAL TRANSF. KVA	3750	3750	6000	4500
FIRM LOAD CAPACITY	—	*3750	* 3750	*3750



SAFETY	A	C	A	B
SERVICE RELIABILITY	D	C	B	A
EASE OF OPERATION	A	B	B	B
MAINTENANCE	A	C	B	D

*FOR H.T. FEEDER OUTAGE ONLY
**BASED ON LOAD AREA DEFINED IN TEXT

The comparative installed cost and electrical performance characteristics of the various arrangements of load-center systems, as illustrated in Figs. 4, 5, 7 and 8, are presented in this table. Qualities which cannot be evaluated numerically are rated "A", "B", etc., "A" representing the best.

to re-establish service to all load centers with one primary feeder deenergized.

A failure of one primary cable would interrupt service to those load centers which were being fed from this circuit. Service can be restored by changing the position of the transfer means at the respective load center unit substations. The duration of the outage will depend on the time required to locate the system operator who is authorized to operate the transfer means and the time consumed in visiting those stations at which power interruption occurred.

For maintenance or inspection of primary circuit equipment, only a short interruption is occasioned since load centers are individually transferred before deenergizing the primary feeder.

It is important to note that, following reestablishment of voltage on a primary feeder, load center units should again be returned to their normal feeder, which will account for another service interruption of short duration.

The use of a primary loop circuit as illustrated in Figure 6 constitutes a variation of the primary selective circuit arrangements. Unless automatic sectionalizing circuit breakers are incorporated, a primary circuit fault results in an extended interruption to the entire load, no part of which can be reenergized until the circuit has been sectionalized to exclude the faulty section. The chief advantages of the loop circuit are: (1) The ability to combine feeder and tie circuit functions when primary power supply stations are located on opposite sides of the plant. (2) The ability to isolate a particular load center in the event that fire or explosion should damage both primary cables at one location. (3) Primary circuit loading is inherently equalized with both primary switches at each load center closed as they normally would be.

The installed cost is increased due to additional primary switching equipment, high tension cable, and the use of primary transfer means on all load center unit substations. The cost of this arrangement, relative to the cost of the simple radial becomes about 130%.

For a primary circuit interrupting requirement not exceeding 50,000 kva at circuit voltage below 5 kv, metal-clad circuit breaker transfer means, including a two-position structure with one circuit breaker, can be used without increasing the overall cost level by more than approximately 5%, as compared with disconnecting switches as the transfer means.

Safety is impaired when the primary transfer means is disconnect switches. Although interlocked to prevent operation except when low tension breakers are open, hazards nevertheless exist. The presence of a transformer turn-to-turn coil failure may allow the flow of substantial primary current irrespective of low tension breaker position. A major electrical fault at a transformer or its associated primary connections, which produces a primary circuit trip-out, may lead to serious consequences since normal routine procedure provides for transferring all deenergized load center units to healthy feeders. When the faulty transformer is so transferred, the faulty circuit is closed on the healthy feeder by means of the transfer disconnect switch. Of lesser importance but nevertheless disturbing is the fact that a complete shutdown of both primary feeders results and much confusion may easily exist.

Circuit breakers adequate for high tension system short circuit duty should be considered in all cases, as they eliminate the shortcomings of disconnect switches.

Service reliability is much better than that provided by this circuit arrangement except under unusual circumstances as covered under the topic of safety. It is to be expected that primary circuit failures will be far more numerous than transformer failures, many

(Continued on page 58)

"Lines of Light" Illuminate Fluorescent Factory

CONTINUOUS trough lighting units installed on 10-foot centers provide minimum intensity of 72 foot-candles throughout all working areas of Hygrade Sylvania Corporation's new fluorescent lamp plant at Danvers, Mass. All fluorescent lamp production for Hygrade Sylvania is now located at the new 105,000-square-foot plant recently completed.

In the main manufacturing area these lighting units have been suspended from messenger cable strung from the bottom chord of the trusses, so that hangers were not necessary. A total of 1,023 units, including 18 different types, with over 10,000 lineal feet of fluorescent tubes have been installed in the plant.

Already operating on two shifts, the plant is capable of turning out an average of more than 100,000 fluorescent lamps per day to meet the increased requirements of windowless factories and other defense plants. Transfer of these activities from the headquarters plant at Salem, Mass., to Danvers, where Frank A. Poor, founder and treasurer of the company, established Hygrade's first plant 40 years ago, was accomplished with the loss of but one day's production per machine.

All equipment acquired for the new plant was ready for operation on December 1, 1941, with personnel from the Salem plant to man it. On the previous day the first of the units at Salem was dismantled, moved and set up ready for operation at the new plant by the next morning. On each succeeding day the same procedure was followed, until all units had been moved.

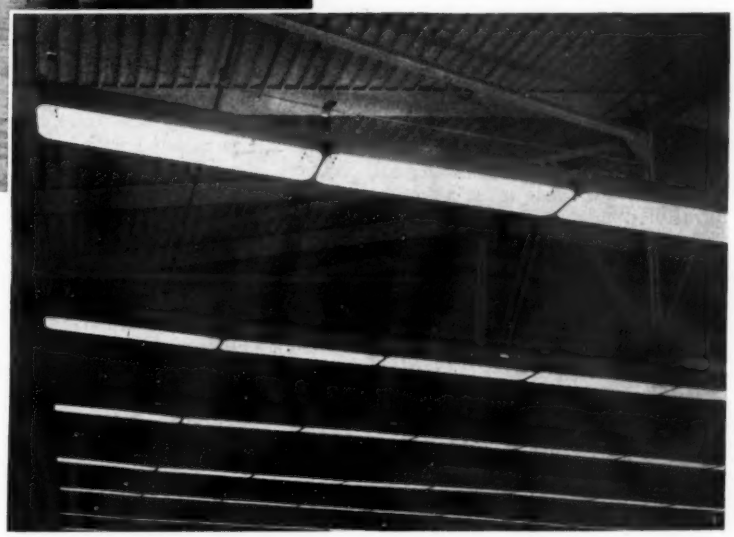
By thus transferring personnel to machines all set for operation in the new plant at the very hour when the units on which they had been working were shut down for moving, hardly a minute of production time was lost.

Lamp production is concentrated in an unobstructed manufacturing area 100 feet wide and 380 feet long, entirely free from inside columns, on the second floor of the plant.

Incoming materials are received on the first floor over several truck docks and stored there, pending their use in production. Glass tubes are cleaned, fluorescent coated, baked and inspected in line production on the first floor. Special conveyor systems are used throughout.

A special ventilating system designed to maintain dust-free conditions and comfort temperatures throughout the plant is featured by the extensive use of reinforced concrete pipe. Fresh air is washed and filtered in a series of chambers at ground level outside the building proper, where hot water lines and deep well water will be used for central heating and cool-

(*Continued on page 27*)



At left, one of the aisles at the Hygrade Sylvania Corporation's new fluorescent lamp plant at Danvers, Mass. Continuous trough lighting has been provided with 3-lamp fluorescent units installed on 10-foot centers to provide a minimum intensity of 72 foot-candles in all working areas. Continuous trough lighting units at the Hygrade fluorescent lamp works at Danvers, Mass., have been suspended from messenger cable which was strung along the bottom chord of the trusses. This eliminates the use of hangers. (Photos courtesy The Austin Co., Engineers & Builders.)

Industrial Wiring Practice

Part 2—A continuation of the discussion of the basic Code tables and their correction factors. The use of cables in parallel is discussed further in this article.

By B. Z. Segall*

It is hoped that these expositions on industrial wiring applications and installations will, in some measure, assist you in your work. This series is designed to give you *an* answer to your problem. It may give you *the* answer, but it can only assist you in as much as you will let it. The editors will welcome suggestions as to just what topics you would like to have discussed in future articles.

●

IN THE preceding article of this series, it was found that a Type RP insulated cable carrying 265 amperes at 50° C. average temperature would have to have a minimum size of 1,000,000 cir mils. If a three-phase, three-wire load is to be supplied from this circuit, this would necessitate the handling of three 1,000,000 cir mil conductors. Pulling three such wires into a conduit system and performing the necessary operations for connecting them to the various parts of the circuit is quite an arduous task.

As a general rule, it is easier to handle six smaller wires, allowing two conductors per phase. However, the use of cables in parallel offers further problems for the wiring design engineer.

Primarily the Code does not, at present, recognize the general use of paralleled conductors. Such installations require special permission from the Code authorities (usually written permission). When permitted they should, of course, be carefully designed. The most important factors are:

(*Since this article was written, the Electrical Committee, of N.F.P.A., the body sponsoring the National Electrical Code, has adopted an Interim Amendment approving the practice of paralleling conductors under certain specified conditions.* *See page 32 of this issue.* *—Editor.*)

(1) **The conductors must be the same size.** Thus a 500,000 cir mil and a No. 4/0 cable must never be paralleled due to the unequal division of load that would result from the difference in resistance between the two cables. 500,000 cir mil cable has .02 ohms per 1,000 feet while No. 4/0 is 2½ times as great in resistance, or .05 ohms per 1,000 feet. It is possible to design systems with unequal conductor sizes in parallel but in the long run it would be a rather laborious effort which could be eliminated by a simpler, more economical and practical plan of using conductors of same size.

(2) **The conductors should have the same physical characteristics.** Thus, two Type RH insulated cables should be used. A Type RH and a Type R cable in parallel is distinctly of no advantage since the circuit as a whole is limited by the capacity of the Type R insulation. Sometimes it may be necessary to parallel two different types of insulated conductors, especially in these days of priority and "use-what-you-can-get." It must be remembered that the circuit capacity is governed entirely by the lowest quality cable in the group. Thus a 500,000 cir mil Type RH paralleled with a 500,000 cir mil Type R insulated cable can only be rated for 265 amperes, the maximum capacity of the Type R insulated conductor, disregarding other factors which will be discussed later.

Another characteristic which must be closely matched is stranding. If a 19-strand cable is used for one conductor it would not be advisable to use a 91-strand for the other. The slight difference in resistance may cause serious unbalance of load between the two paralleled cables and overload one of the cables very seriously. In line with this factor of resistance and unbalance of load just referred to, it is, of course, important to have all wires of paralleled circuits, of equal length.

(3) **Keep the number of conductors to be paralleled to a minimum.** The maximum number should be kept to two conductors. If this cannot be worked out satisfactorily, some other wiring scheme such as bus ways or separate service or feeder runs extended for different sections of the load may expedite the installation considerably. However, many installations have been designed and are giving highly satisfactory operation with more than two conductors paralleled for each feeder line.

(4) **The code provides that multiple operation of conductors, if approved, must have the terminal ends of the paralleled conductors joined together both mechanically and electrically.** This, of course, further insures equal division of load between the multiple cables.

Several problems are involved in the use of paralleled conductors. It may be necessary and, as

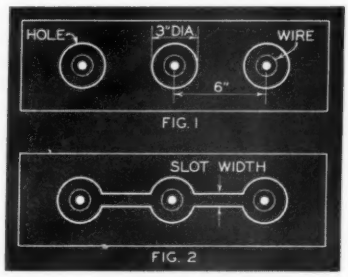


Fig. 1. When large conductors are brought through metal enclosures through holes as shown here, the metal housing will be heated considerably.

Fig. 2. A slot connecting the three holes shown in Fig. 1 will materially reduce the heating. A wider slot will permit a greater load current for a given temperature rise in the metal enclosure.

*Mr. Segall is associated with the engineering department of New Orleans Public Service, Inc., New Orleans, Louisiana.

Throughout this series of articles, all references to the "Code" refer to the National Electrical Code, 1940 Edition. Copies of the Code will be mailed promptly upon receipt of 10c. Address requests to ELECTRICAL SOUTH, Grant Bldg., Atlanta, Ga.

will be explained in detail in a subsequent discussion, expedient to extend the paralleled wires in two or more separate conduit lines. For example, a circuit requiring six 2,000,000 cir mil Type RH insulated cables of two conductors per phase would require a single conduit having a cross sectional area of approximately 47 square inches. The largest size of standard conduit, i. e., 6-inch trade diameter, has but a 29 square inch cross section. It will be necessary therefore to extend two 6-inch lines for this circuit.

Another angle to be considered during these times is that of using whatever material is available. Thus, returning to the 500,000 cir mil circuit, we find that six cables with two cables per phase would require a 4½-inch conduit. If only 3-inch conduit is available, two 3-inch lines will carry this circuit although this is not the most economical set up. Two 3-inch conduit lines will cost approximately 15% more than one 4½-inch line.

Inductance to Be Considered

In extending these multiple feeders in two or more separate conduit lines, it is important to keep in mind certain factors that affect these conduit systems if a-c circuits are involved. It must be remembered that alternating current flowing through conductors form alternating magnetic fields, which reverse direction at the rate of 120 times per second for standard commercial practice (60 cycle). This field in "cutting" conductors induces in them a current which reflects itself in the wires of the circuit as current retardents known as mutual and self inductances.

These fields also "cut" the conduit enclosing the conductors and since the conduit is in effect a high resistance conductor, it has a current set up in it. This current usually is dissipated in the form of heat, raising the temperature of both the conduit line and the conductors within. However, for a circuit in which all conductors of the circuit including a neutral wire if used are contained in a single metallic raceway, the various fields from each wire counteract each other as far as the conduit is concerned and the net current flow and the incipient heating within the conduit is negligible. It is important, therefore, that "if the capacity of a circuit is

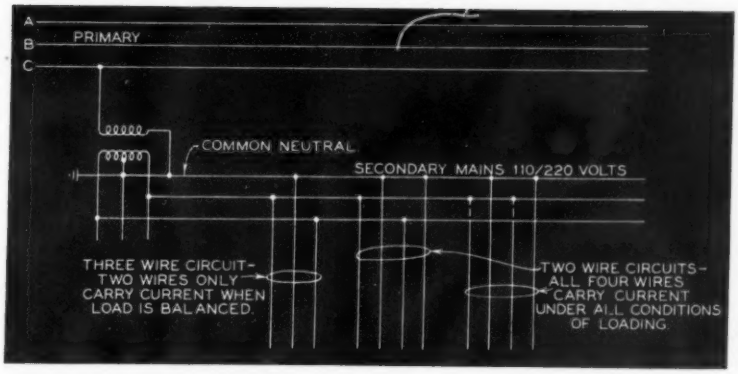

A
B
C
PRIMARY
COMMON NEUTRAL
SECONDARY MAINS 110/220 VOLTS
THREE WIRE CIRCUIT—TWO WIRES ONLY CARRY CURRENT WHEN LOAD IS BALANCED.
TWO WIRE CIRCUITS—ALL FOUR WIRES CARRY CURRENT UNDER ALL CONDITIONS OF LOADING.

Fig. 3. The Code rules relating to the number of wires in a conduit, where a factor is to be applied to determine current carrying capacity if more than three wires are included in a conduit, refer to conductors normally carrying load current and not those which function only to carry unbalanced current. For example, the 3-wire circuit at left would be counted as only two wires while each of the pairs of 2-wire circuits would be considered as four wires.

such that it is impracticable to run all conductors in one enclosure, additional enclosures (conduit, flexible metallic raceways wireways) may be used, provided (a) the conductors in any one enclosure are balanced in size and (b) include one from each phase."

Thus, as long as the two three-inch conduit lines referred to above each contain three 500,000 cir mil cables and one cable in each conduit is connected to one of the three phases of the circuit, respectively, no heating effect will be evident in the conduit itself.

While on the subject of heating effect another phenomena may be discussed. Quite often conductors are brought into cabinets through holes drilled in the steel cabinet housing. For example, referring to the diagram, Figure 1, it will be seen that three conductors are extended through the iron or steel loop through three, 3-inch diameter holes on 6-inch centers. If the plate is 1/8-inch thick, these three conductors carrying approximately 260 amperes will induce enough current within this steel plate, according to recent tests, to raise its temperature 10° C. Four hundred amperes will raise the steel plate temperature 20° C., and 520 amperes will raise it 30° C.

If a slot is cut in the plate, connecting the three holes as shown in Figure 2, this temperature may be materially reduced. Or stated another way, the slot will permit a high current carrying capacity for the cable for the same temperature rise. Thus a 1/16-inch slot will permit 450 amperes in each conductor for a 10° C. rise in the temperature of the steel or approximately a 75% increase in capacity. Seven hundred amperes will produce a 20° C. rise and 900 amperes would be required to raise the temperature 30° C. If the slots are cut to 3/4-inch width, a 10° C. rise will result with 720 amperes flow; 20° C. rise, for 1110 amperes, and 30° C. rise, for 1420 amperes.

It will be noted that the subheading to Table 1 of the Code (page 301) limits the current carrying capacities to three conductors in a raceway or cable. The intent of this is to apply to three conductors normally carrying current and not to include those wires which function only to carry an unbalanced current. Thus a three-wire, 115/230 volt d-c or single-phase circuit supplied from a system as shown in Figure 3 is actually only a two-wire circuit since the neutral in these two installations carries the unbalanced current. Under balanced load conditions only two wires are actually supplying the load.

Number of Conductors

However, a three-wire single-phase circuit derived from a four-wire "wye" system as shown in Figure 4, must be considered as a three-wire circuit. In this type of circuit, for balanced loading of the phase wires, the neutral actually carries the same amount of load as do the two-phase wires. The neutral, in other words, contributes to the heating of the conductors whenever any load is be-

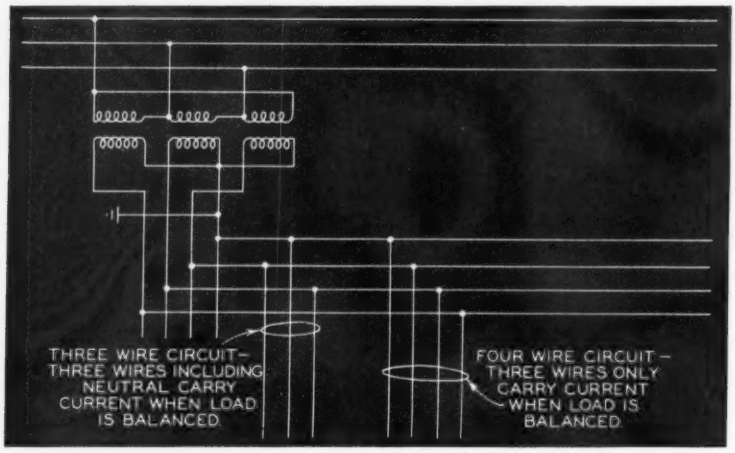


Fig. 4. In the case of four-wire, three-phase systems, a 3-wire circuit such as shown at the left must be considered as three wires since all three wires carry current even when the load is balanced. However, a four-wire circuit such as shown at right would be considered as only three wires because the neutral carries no current when load is balanced.

ing carried by the circuit.

Referring again to Figure 3, assume that the two 2-wire circuits shown are extended in one conduit line. Under all conditions of loading, all four wires carry current and the carrying capacity of each wire must be reduced since Table 1 is limited to a maximum of three wires in conduit or cable. Referring now to Figure 4 the four-wire circuit derived from this secondary does not have any current flow in the neutral for balanced loading so this circuit still remains a three-wire circuit as far as the application of Table 1 is concerned.

A special wire committee, in making extensive studies and tests, investigated the effect of the number of conductors in a raceway or cable. They found, naturally, that as the number of conductors in the conduit, tubing, raceway, etc., is increased, the insulation is heated to its maximum operating temperature at a faster rate. Furthermore, the current capacity of the wire had to be decreased if the operating temperature of the insulation was to be kept at or below the maximum safe value. To establish a practical procedure for the use of this information, the new carrying capacity tables have been set up as shown by the 1940 Code.

Any three conductors or less in any type of raceway, metallic or non-metallic, or cable, carrying current under balanced conditions, can be loaded as shown by Table 1. However, if the raceway or cable contains more than three normally-current-carrying conductors, these wires must not be loaded to the full values shown in Table 1. If four wires but not more than six are in one raceway or cable, these capacities must be reduced to 80% of the values shown. If seven wires but not more than nine are in one raceway or cable, the maximum permitted under general code rules, are used then the current values must be reduced to 70% of those shown in the table.

Thus referring again to the problem of substituting two smaller wires for each 1,000,000 cir mil Type RP wire that must be installed to serve the 265 ampere load at 50° C. average temperature, we can now design a single conduit line to contain six smaller and easier to handle conductors in place of the three unwieldy 1,000,000 cir mil cables.

First, it must be determined whether or not all conductors will normally carry current. Since a three-phase, three-wire circuit is under consideration, all six conductors will carry current under all normal loading conditions. Therefore, in addition to the temperature reduction factor of .58 (see January 1942 issue, page 32), we must apply a further reduction factor of .8 to compensate for the faster heating of the conductors and the subsequent possible higher maximum operating temperature of the insulation if the current capacity of the cable were not reduced.

The 265 ampere load will be carried by two cables, therefore, under basic conditions of three or less cables per raceway and under normal 30° C. temperature, each cable must be capable of carrying one half of this current or 132.5 amperes. Because of the higher temperature operation a cable capable of carrying 132.5/.58 or 229 amperes must be used.

Furthermore, because of the greater heating effect resulting from location of all six cables within one raceway, the conductor size must be further increased to compensate for this effect. Therefore, the final cable size selected must be large enough to carry 229/.8 or 285 amperes. Referring to Table 1, page 301, of the Code, it will be noted that a 400,000 cir mil Type RP insulated cable could be used.

To summarize, six 400,000 cir mil Type RP insulated cables in a 4-inch conduit will serve a 265 ampere, three-phase, three-wire load under average temperature conditions of 50° C. equally as well as three 1,000,000 cir mil conductors of the same type and in the same size conduit. Both types of circuits will not cause the operating temperature of the conductor insulation to rise above 60° C. for the maximum loading of 265 amperes per phase.

It is interesting to note that in addition to the labor savings affected by the use of the six smaller wires, the actual cost of the double footage of the 400,000 cir mil cable required will be about 15% to 20% less than the cost of the 1,000,000 cir mil conductors. The 1,000,000 cir mil circuit has an advantage from the standpoint of resistance value. It will average about .01 ohms per thousand feet compared to .013 ohms for the two 400,000 cir mil conductors in parallel. This will result in slightly less voltage drop for the 1,000,000 cir mil circuit.

If, as previously mentioned, it is more expedient to install two separate conduit lines, then each cable must be capable of carrying 229 amperes since only the .58 reduction factor for temperature need be applied. A 300,000 cir mil feeder will suffice for this circuit. Two 3-inch conduit lines will be required at an additional cost of about 33% more than the single 4-inch line. However, the 300,000 cir mil cable line will cost about 25% less than the 400,000 cir mil

(Continued on page 56)

Utility Finances Rewiring Jobs to Promote Adequacy

By Chas. V. Dunn*

FOR THREE YEARS we have heard a great deal about adequate wiring, and how it benefits the users of electric service and the entire electrical industry. However, all of this promotional activity and publicity has been directed toward new homes, which is all very fine. But, what has been done about the wiring in the many homes now receiving service? The homes which were built 15, 20, or more years ago.

For a number of years the entire electrical industry has fully realized the inadequacy of the wiring in these older homes. Some thought and a great deal of talk has been devoted to the subject, but very little has actually been done about it. Of course, the small electrical contractor has been installing an additional outlet now and then, when the home owner called him and insisted that he needed a certain outlet at a certain place. The payment for such work is usually on a cash basis for the full amount or, occasionally, if the job is of considerable size, the contractor takes a chance on collection in monthly payments. If the job is for more than three or four outlets, the amount of payments, in most cases, is larger than the average home owner wishes to part with out of his monthly budget.

In Kansas City, at the request of a committee from a local electrical contractors association, a plan was worked out and made available to all K. C. Power & Light Company residential customers, whereby additional wiring could be installed and paid for in monthly payments on the electric service bill. This plan was made available in September, 1941.

The plan is on an experimental basis and is being tried to see what effect, if any, it will have toward installation of additional wiring in existing homes. It is thought that such a plan is probably the first step in attempting to do something about the wiring in old homes; to make it more adequate and usable.

The basis of the plan is the contract or agreement between electrical contractor and home owner, which, after completion of the work, is assigned to the company for collection of the balance of the account. As the contract is an agreement between the contractor and home owner, the company assumes no responsibility nor guarantee for the wiring installed. However, certain stipulations are made that the contract must include, which are as follows:

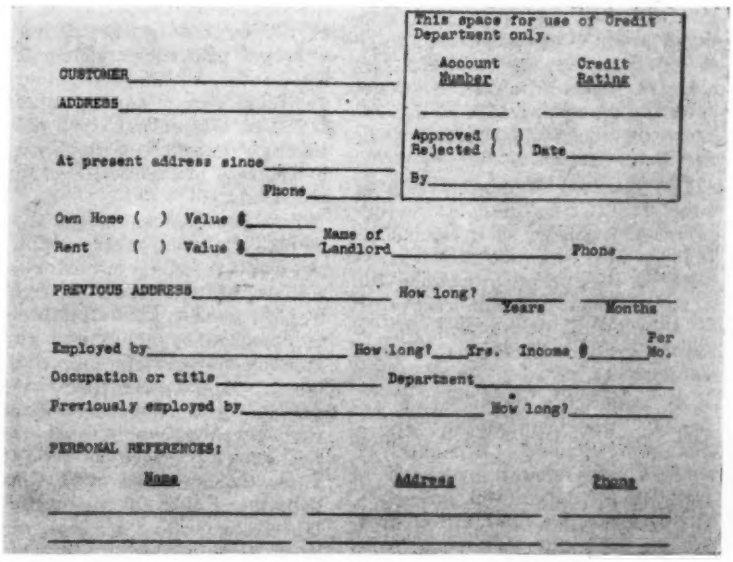
1. Payments of not less than $1.00 per month, and extending over not more than 12 months.
2. Down payment of not less than 10%.
3. Carrying charge at rate of 6% per annum on unpaid balance, with a minimum charge of $1.50.
4. Minimum balance, including carrying charge, to be not less than $12.00.
5. Maximum balance to be not more than $60.00.
6. Each job must have at least three duplex convenience outlets, or equivalent.
7. Contract must be on a standard House Wiring Agreement form, to be furnished by the company.

Operation of Plan

When the electrical contractor is successful in selling a wiring job of this kind, he must fill out the House Wiring Agreement, setting forth the amount of the work, down payment, carrying charge, etc., and the amount of the monthly installments. The customer is required to sign the form, witnessed by the contractor or his salesman. The customer keeps one copy of the agreement and the first and second copies, along with credit information furnished on credit form, are sent to the company.

Company approves or rejects the credit and the contractor is notified accordingly. When credit is satisfactory, the original copy of the agreement is returned to the contractor and he is notified to proceed with the work. Upon completion of the work the customer signs the House Wiring Agreement, indicating satisfactory completion, the contractor collects at least 10% down payment, and returns original copy

(*Continued on page 56*)



This space for use of Credit Department only.
Account Number
Credit Rating
Approved ( )
Rejected ( ) Date
By
CUSTOMER
ADDRESS
At present address since
Phone
Own Home ( ) Value $
Rent ( ) Value $
Name of Landlord
Phone
PREVIOUS ADDRESS
How long? Years Months
Employed by
How long? Yrs. Income $ Per Mo.
Occupation or title
Department
Previously employed by
How long?
PERSONAL REFERENCES:
Name
Address
Phone

The contractor supplies this credit information to the Kansas City Power & Light Company on a prospective wiring customer. If the credit is approved, the contractor collects 10% from customer and obtains balance from the utility which then bills the customer each month by adding payments to regular service bill.

*Mr. Dunn is technical advisor on wiring promotion for Kansas City Power & Light Company, Kansas City, Mo.

Defend Your Business Security With Better Management

3. Depreciation—Part of Overhead Expense

By Arthur Roberts

This is one of a series of articles which will discuss various phases of business management from the viewpoint of the electrical contractor and appliance dealer. The first article of the series appeared in the December 1941 issue of this publication.

Questions by readers relating to their specific problems in cost accounting, department records, etc. will be given prompt attention. Address such inquiries to the editors.

DEPRECIATION, little understood by many electrical contractors, is an important factor in business management. Unless handled properly:

(1) Net worth will be inflated.
(2) Overhead will be computed incorrectly.
(3) Estimates will be too low for adequate profit.
(4) Income tax payments will be too high.
(5) The books will show an inflated value for working assets.
(6) Experience records, an aid in computing current estimates, will be erroneous yardsticks.

Probably no other phase of business management has been covered in so many different ways in books, articles and speeches and this copious data has done more to confuse than clarify understanding. We therefore present the fundamentals of depreciation in a simple manner. With the basic factors clear in mind, the electrical contractor will have sufficient knowledge of depreciation to handle it properly for his purpose. For easy assimilation, this subject may be divided into three main classifications: (1) its purpose; (2) its computation; and (3) its handling from an accounting viewpoint. We will elaborate on these classifications in the order named.

The purpose of depreciation is two-fold: (a) to include the depreciation charge in overhead so that the cost of an asset, pro-rated over its life, or an allowance for a contingency, may be recovered in the selling price; and (b) to record gradual decreases in asset value.

By ommitting depreciation expense, the contractor shortchanges himself because he doesn't add enough overhead to the cost of labor and materials, thus decreasing installation profits, an oversight common to more than 50 per cent of the members of this industry, if our experience is any criterion.

If a contractor's sales are $40,000 yearly and his overhead expenses without depreciation total $14,000, the overhead-to-sales ratio for computing selling prices is 35 per cent. If his overhead expenses plus depreciation total $16,000, his overhead-to-sales ratio is 40 per cent, hence, in figuring margin of profit without depreciation expense included, a contractor will not be getting enough for his installations. He will, in this case, cut net profit 5 per cent, probably enough to go in the red.

To get profitable selling prices, the contractor must consider the overhead percentage to sales and if this percentage is reduced through omission of depreciation, his selling prices will be reduced accordingly.

Working assets, such as materials, fixtures, trucks, building, power tools, small hand tools, arc welder, test instruments, hydraulic pipe pusher, bender, cable puller, knockout punches and cutters and the many other tools that cut labor cost and save vital hours on defense jobs, depreciate from 2 per cent on beam punches to 60 per cent for ½-inch pipe dies. Tool costs average more than 10 per cent of original cost per month in many cases. Such tools should be written off within the year and if this isn't done, as often happens, there is a substantial job loss.

Accounts receivable depreciate in value, too, and this loss should be taken care of by an allowance for bad debts. Whether a working asset is bought for cash or on time payments has nothing to do with the depreciation charge. Neither is the charge limited to the year of purchase. If assets are listed at cost price indefinitely, the net worth will be inflated. Thus it is with many contractors who have assets recorded at cost prices when they are worth little more than scrap value and the difference should have been written down annually from the time of purchase. The statements of such contractors showed a bloated net worth.

The computation of depreciation is always an estimate. There is no way to figure it to the penny. We have never known a case where depreciation charges at termination of write-downs have equalled original cost on the books, whether or not salvage or trade-in value was considered. To fix depreciation expense, take the cost of an asset, which is known. The profitable life of an asset is the unknown factor. Estimate its span of usefulness by checking against your own experience with the same or similar assets. Lacking such experience, seek advice from equipment manufacturers or

No contractor can afford to overlook depreciation. If adequate allowances are not made . . .

(1) Net worth may be inflated.
(2) Overhead will be computed incorrectly.
(3) Estimates will be too low for adequate profit.
(4) Income tax payments will be too high.
(5) Books will show an inflated value for working assets.
(6) Experience records will be erroneous yardsticks, instead of aids in computing current estimates.

other contractors or accountants. With the life span set, divide the years into the cost to get the annual depreciation charge.

For example, a truck costing $1,000 with an estimated profitable life span of five years will carry a depreciation charge of $200 yearly. In making the estimate, consider the profitable life, usefulness or capacity. Scrap or trade-in value cannot be considered. Make this adjustment when the working asset is eventually scrapped or traded-in.

Depreciation varies with the asset. It also varies with the type asset used. Certain assets have a longer span of usefulness than others. This must be considered. Depreciation differs with the type asset. A building depreciates less rapidly than an adding machine or drill bit. The care given a working asset is another factor. Unless you keep assets in good condition, they will depreciate more rapidly than estimated.

Obsolescence, in some cases, complicates the write-downs. Servicing equipment grows obsolete before it wears out in these fast-moving days. There are two kinds of obsolescence, that which is predictable with reasonable certainty and the accidental kind, unforewarned and therefore in the nature of a loss. If an asset will seemingly grow obsolete before its profitable capacity has been reached, you may consider obsolescence when fixing the depreciation rate. Obsolescence may be combined with depreciation or figured separately.

Many contractors use the depreciation rates shown in the accompanying table. These rates are guides. Your experience should influence the fixing of rate schedules to a large extent.

Suggested Annual Depreciation Rates for Electrical Contractors

Item:	*Yearly Deprec. Rate in %*
Wooden Buildings	3
Brick Buildings	2
Furniture and Fixtures	10
Delivery Trucks	25
Accounts Receivable (in % of credit sales)	2
Motorized Tools	25
Hand Tools	50
Elevators	5
Mechanical and Other Office Equipment	10
Materials and Supplies (in % of purchases)	1

How to Handle Depreciation

The handling of depreciation on the books involves the opening of an account for this expense and charging profits with the annual installment or preferably, 1/12 of this sum monthly. The offsetting credit goes to a reserve for depreciation. Compute this expense upon each asset separately but all entries may be made on one ledger page for convenience. Likewise, with the offsetting reserves. They may be placed on one page in the ledger.

An expenditure for replacements or repairs increasing the life of an asset beyond the original estimate should be charged to the reserve account, which prolongs the schedule that much more because it reduces that year's write-downs. Credit balances on reserve accounts resulting from annual depreciation charges to profits should not bear interest.

Never increase the original cost of a working asset. Even if its market price increases, that does not warrant the taking of appreciation. When assets are written down completely, depreciation ceases and obviously, profits in subsequent years tend to increase without this load. We often contact a contractor who has written assets off the books and is reluctant to invest in modern replacements because he does not want to reduce profits in subsequent years with depreciation charges on the new assets. This is a short-sighted business viewpoint. Old working assets increase overhead expense and labor costs, hence these deficiencies exceed the depreciation charges brought into being by the purchase of modern and adequate replacements.

"How shall I compute a fair rate?" is a question frequently asked by electrical contractors. There are ten methods of figuring depreciation and they cause considerable confusion. All recognized methods may be used by the same contractor. Many who ask us to detail the various methods, assume that a method other than the one they use may reduce depreciation expense. We have done extensive work on all ten methods and find that we can recommend only the following:

(1) **The straight-line method of depreciation.** The original cost of a working asset is divided by its useful life, the result being the annual depreciation charge. If a working asset worth $1,200 has a profitable life span of six years, the depreciation charge is $200 yearly.

(2) **The reducing installment** method. The heaviest charges fall during the early years of use on the assumption that a working asset is second-hand in three months and would sell for half its cost. This reasoning seems unsound, although some authorities favor it, but depreciation measures the service of a working asset, not its market value. Moreover, the average business must be considered a going enterprise and its operating expense handled accordingly. Then too, this method will swell costs and selling prices abnormally during the early years of equipment use. Nevertheless, this method may be worth consideration from the standpoint of expense equalization if the investment in assets is high. During the early years of use, repairs and maintenance on a working asset are low. In latter years, this expense mounts. By loading the early years with heavier depreciation charges, this tends to equalize the expense over the years.

(3) **The appraisal method.** A physical check-over of all working assets to determine their worth, not in terms of normal years service as per depreciation schedules but with regard to actual physical condition. Even

(*Continued on page 56*)

Incandescent Fixtures Chosen For Exclusive Dallas Store

By Nat M. Johnson

IN THIS PERIOD of rapidly expanding use of fluorescent lighting, it's really news when a customer selects incandescent lighting in order to make his establishment different! But that's exactly what occurred in the remodeling of an exclusive store in Dallas, Texas.

This interesting wiring and lighting installation was completed recently by H. A. Brewster, owner of Superior Electric Company, Dallas, in the Neiman-Marcus Store, which is rated as one of the top three stores of its kind in America. The "man's shop" was enlarged and completely remodeled and at the same time, the first, second and third floors of the main store were re-decorated and completely relighted.

These views of sales rooms in the relighted Neiman-Marcus Store, Dallas, Texas, show the effective use that has been made of prismatic fixtures and spotlights.

Store remodeling was planned by the nationally known interior designer, T. H. Robsjohn-Gibbings, of New York, and Rene C. Brugnoni, architect, also of New York. Logan Knapp, lighting engineer of Dallas Power and Light Company, worked with Mr. Brewster and the others on the lighting design.

Popular and efficient as fluorescent lighting is, the customer would not use it except incidentally. Considerable Zeon tubing was used, but the store stayed with incandescent lighting because, Mr. Knapp explains, "the public is more familiar with this type and there is no alteration of color under the older incandescent lighting—and then this outstanding store likes to be different." The wide use of Zeon in recessed coves was principally for architectural decoration rather than for utilitarian light.

Primarily, the lighting plan is a most sensible one—to use all of the light and concentrate it on the merchandise. There is ample use of the new reflector lamps, these being installed in such way as to have the face of the lamps flush with the ceiling.

The use of fluorescent lamps was confined to totally indirect coffers arranged symmetrically to create an interesting light pattern. The building engineer maintains a complete stock of lamps of several colors and changes the lamps when they want to achieve different decorative effects.

Color caps were installed for flexible color changes on different merchandise or on special displays. Light throughout the store will average 25 to 30 foot candles.

Several new show cases of modern design in light-finish wood were installed, replacing others of a rather dark and somber color. All of the new cases, as well as older wall cases, are lighted with tubular incandescent lamps.

Direct-type, recessed incandescent lighting was used in the men's shop, occupying the first and third floors of a separate section at the inside of the building. These are recessed fixtures with control louvres, using 300-watt lamps. Light sources were louvred in order to shield the direct view of the source, and to cut down on surface light. Coves using Zeon tubing were placed all around the room to fit in with the fixture layout.

Spotted at strategic locations throughout the men's department are recessed display niches and cases. High light intensity is provided in these niches for attractive displays of special pieces of merchandise. Facilities were provided for the use of small colored spot lights, recessed in the side walls and heads of the niches.

On the first floor in the main building there was formerly a semi-indirect luminaire in the center of each bay, which was, of course, rather inefficient. There was no means of bringing up the intensity in each bay with a single unit. To rectify this, there was installed a new totally indirect fixture around the other for general ceiling illumination.

In addition, they installed in each bay, four recessed, louvred down-lights, light source being the new 300-watt reflector lamp. Each bay is now lighted with one 300-watt indirect, and four 300-watt recessed fixtures, with control. In this way a high intensity direct-down lighting on counters is obtained; and in the new indirect fixtures, combined with repainting the ceiling and redecorating, there is a well lighted ceiling and store interior.

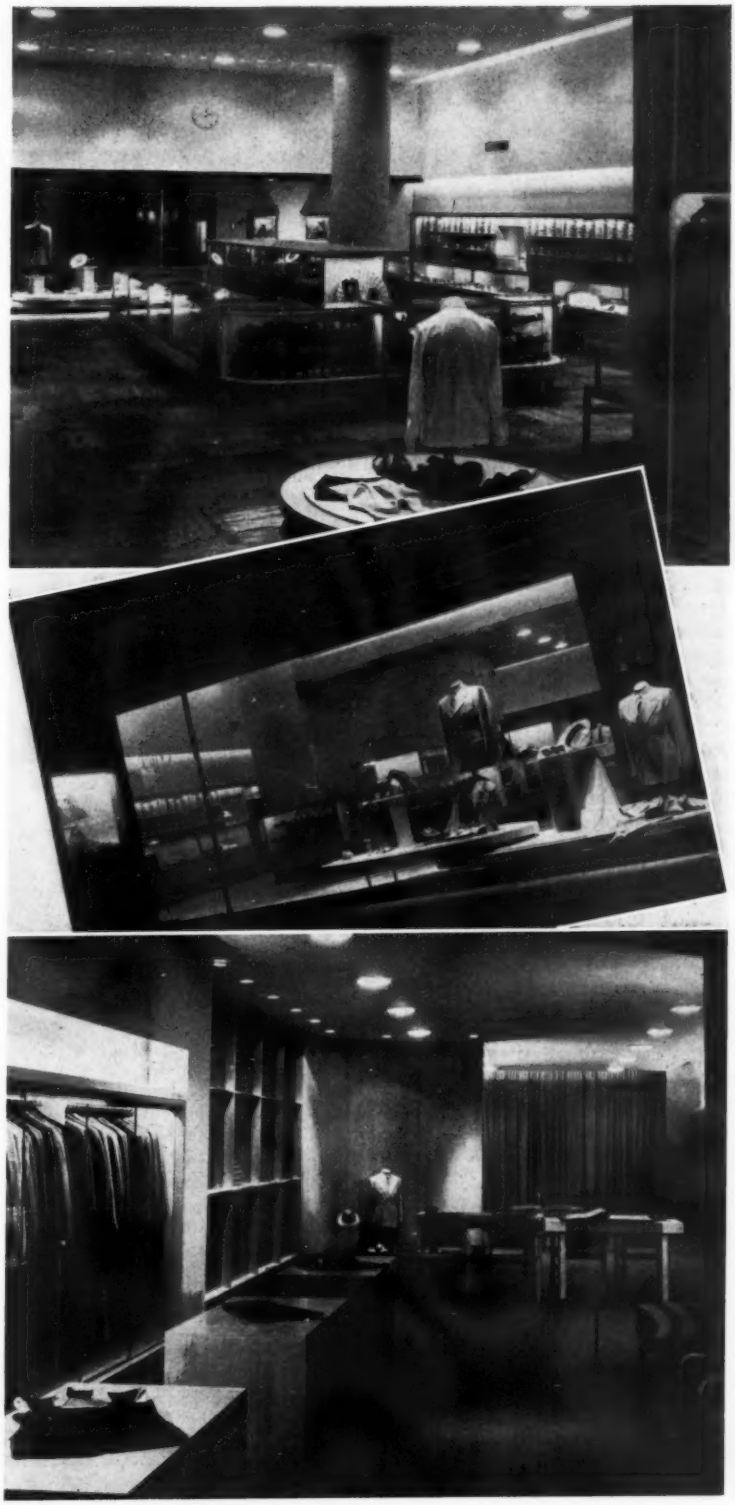
On the second and third floors, architectural designers provided large glass outside wall areas in order to permit a high intensity of natural light, in addition to the well designed artificial lighting system.

Second floor is lighted with 200-watt recessed fixtures. In addition, there is approximately 1000 feet of fluorescent cove lighting. Urns at different spots contain floodlights so designed as to cast a square pattern on the ceiling, bays being square or rectangular in shape.

Floors are broken down into different departments. The second floor, for instance, includes a "hat bar" and a "sweater bar," units of the sportswear department. Prismatic units are mounted here in such a way as to provide a good intensity on merchandise both in shelves and on the open displays.

New floor covering was added, a heavy carpet, of light dusty rose color. It aids materially in reflecting the light back into the room, since little light is absorbed by the carpet. Walls and ceiling are finished in an off-white, neutral tone, which reflects light efficiently.

(*Continued on page 29*)



(Top) The combined effects of general and individual light applications are used advantageously in this accessories department. Zeon tubing is concealed in coves, and louvred downlights with mirrored glass reflectors provide the general illumination. (Center) Window displays are highlighted by deep recess reflector lamps completely hidden in ceiling wells having black non-reflecting walls. (Bottom) Three-hundred watt mirrored glass louvred downlights provide general illumination.

Rural Inspection Service Assures Uniform Practice

By Warner Ogden

COOPERATION between electrical contractors and the City Power Board of Knoxville has resulted in a system of rural inspections that is attracting wide interest. It was commented on favorably at the recent state convention of the electrical contractors.

The city's lines extend into surrounding rural counties and many homes are getting electricity for the first time. Legitimate contractors are eager to have all wiring jobs up to standard, not only by complying with the National Electrical Code but with other requirements that may apply. To take care of rural inspection, the state agreed to let two inspectors work in the territory. They inspect every job outside the city, the city having its own inspector, of course.

Each morning, C. R. Wardell, head of the city's electric meter and installation department, hands an inspector a list of new wiring jobs. The inspector goes out and checks each job carefully. He takes along testing equipment. If a job is satisfactory he notifies Mr. Wardell, who releases an order for service at the building.

Both Mr. Wardell and E. D. Armstrong, wiring inspector working outside of Knoxville, said that electrical contractors had commended the plan. "It puts all on an equal basis," said Mr. Wardell. "All have the same chance to get a job. Good, legitimate contractors are very much for it."

Mr. Armstrong commented, "It is a wonderful thing. Rural work is brought up to standard. It must have an OK to get city service. Electrical contractors themselves wanted such inspections."

C. R. Wright, president of the Tennessee Electrical Contractors, is strong for it. "It means that a job has to be done right," he declared. "It is of benefit not only to the contractor but to the public as well."

Lester F. Manning, another Knoxville electrical contractor, sees it as "doing away with poor jobs by screwdriver electricians."

Inspectors sent out a special notice to all contractors and electricians, in which they listed inspection requirements and requested: "Please do not come in with the alibi 'This is the way we have been doing it,' 'It has been common practice to do it this way,' etc."

Among their 39 special requirements are some which Mr. Wardell had not heard of being used anywhere else in the South. These, as he checked them off, included:

1. In all business houses regardless of size, the main line switch shall not be smaller than 60 ampere rating.

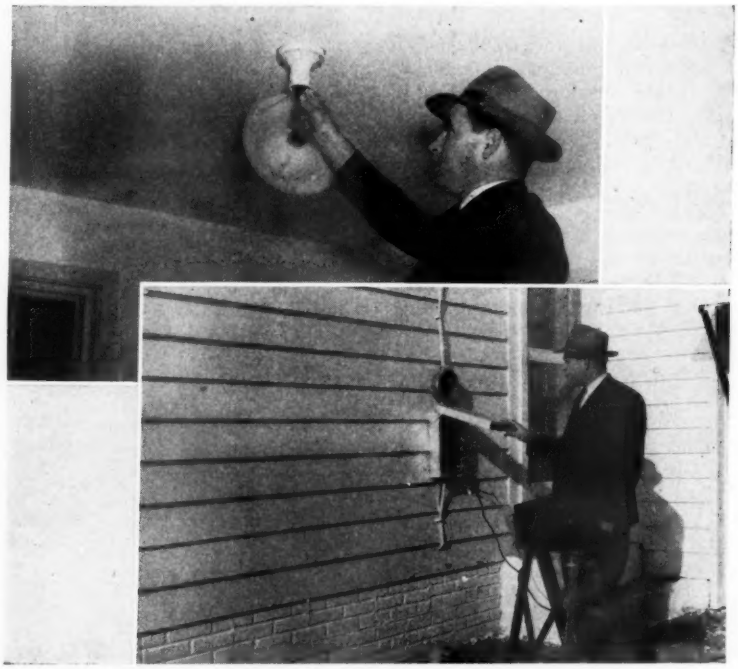
2. A 60-ampere, 3-pole, 250-volt solid neutral switch is the smallest switch that may be used on a house consisting of five rooms or more.

3. You shall not have more than four 15-ampere circuits of lighting, one electric range, and one electric water heater on a 60-ampere main line switch.

4. Service outlets shall be galvanized rigid conduit on all commercial and industrial wiring. For any exceptions see the electrical inspector.

5. No. 4 wire is the smallest size to be used for ground wire.

Mr. Wardell in telling of the start of the system said: "On the first REA project, we found it absolutely necessary and required by the government to have inspection and that gave us an idea. We thought if we could work out



State wiring inspectors have been assigned to the rural area in the vicinity of Knoxville to make inspections that do not come within the city's jurisdiction. This inspection service results in uniform procedure in the territory and assures the contractor who wants to bid on a basis of quality and safety that no less conscientious contractor can get the job through underbidding and supplying cheap materials installed in a shoddy manner. Inspector E. D. Armstrong, in the photos above, tests a fixture and overall circuits. The state inspectors cooperate closely with the Knoxville Electric Power Board.

Particular attention is given to meters in Knoxville. The automatic, photoelectric testing equipment is shown above, while in the photo below is one of the trucks designed for meter service. Trays with sponge rubber bottoms pull out of the side of the truck in which meters are held in place by elastic bands.

the necessary details, it would be fine to have this inspection on all of our projects. C. O. Carpenter, Jr., City Power Board sales manager, and I went over to see State Commissioner McCormack. He felt there was a big field to cover and voluntarily cooperated with us, giving us two inspectors for this territory.

"Through the cooperation of Mr. McCormack and R. E. Ward, chief electrical inspector for Tennessee, we worked out this plan."

As Knoxville is in a low-cost power production area, Mr. Wardell believes that sooner or later every family will have a range or water heater. With that long-range view, services of not less than No. 6 weatherproof wires are run to all houses. That is expected to reduce operating costs in the future.

Another requirement is that all meters be put on the outside of a house. The socket type meter is used, always accessible to meter readers and inspectors. This reduces maintenance costs because it eliminates expense formerly caused by inaccessible meters.

The system installed for Knoxville and six adjoining rural counties is also saving money by a plan of meter inspection and adjustments.

Once every four years, every residential meter is brought in to the test shop, torn apart, all connections tightened, and cleaned. Each coil is tested separately and necessary adjustments are made. The meter is repainted.

Thousands of old meters have been replaced with a new type of meter. The new type can be overloaded 400% and still be accurate. On old types an overload meant a loss.

"We feel that meter inspections can be made better in the shop than on the line," said Mr. Wardell. "We can find worn parts which we might not find by field tests.

"We also find coils that are slightly burned, caused by overloading conditions, which could not be detected by routine tests in the field.

"We also check kilowatt-hours consumed for each customer over a period of 12 months, giving us the necessary data to install the proper size meters to get 100 per cent registration.

"The problem in this area was increased load. Old style meters which do not have overload characteristics are becoming overloaded, thereby causing losses of revenue due to under registration of the meter."

A truck was built with an original design for hauling meters and other equipment. It has racks which can be pulled out of the side of the truck. In each rack is sponge-rubber matting. Rubber bands are used to hold each meter in place.

The truck is equipped with hot sticks, fire extinguisher, first aid kit, reels, heater, everything needed for repairs or servicing. It even has a short-wave radio receiver so that the drive is in touch with the office for orders without having to make extra trips. That is another saving.

"You shoulda seen the job that got away!"

Shifting Appliance Repairs To the Electrical Dealer

By Henry Keele*

THE WORLD'S most famous automobile manufacturer, Henry Ford, once believed that although automobiles eventually needed repair service, this fact should never be mentioned.

It took years for members of his company to learn that service stations were one of their greatest sales assets. It is apparent from past operations that the electric appliance manufacturers' and utilities' ideas regarding appliance servicing paralleled the early thoughts of the automobile manufacturers.

The automobile repair business today gives a good, clear picture of the world of tomorrow in appliance servicing. The tomorrow is only a matter of months, and the picture of opportunity for the electric appliance industry needs only a few finishing touches to make it a masterpiece in record time. I bring this up because there are only two master strokes of the brush needed to complete this picture.

It is now our turn and the manufacturer's turn to use the brush. These two strokes are important to our customers and electric dealers, but they are far more important to us and to the manufacturers.

The shade of color that is used and the care taken in applying these remaining strokes will mean a profit or a loss to all concerned, but the black or red figures on the balance sheet will be much greater for us and the manufacturer.

The point I wish to make is: now is the time of all times for us to turn the fast growing, neglected stepchild—called "Electrical Appliance Servicing"—over to dealers and others who are qualified to rear him to be a helpful and prominent member of the "Electrical Appliance Industry" family who are his rightful parents.

Our allegiance to this youth and his parents should not cease then. We should coordinate our efforts with those of the manufacturer, jobber and distributor to assist dealers in fully establishing their place of business as the new home of this youth called "Electrical Appliance Servicing."

Today he is fast approaching manhood and is destined to be as large, husky and as prominent as his parents, the "Electrical Appliance Industry." His services will be in great demand. He can and will be a breadwinner for them and an asset to us, the manufacturers and our customers. I am confident of his success.

The question now to be settled is why is this the time to change and what are the advantages to be gained.

There are two main reasons why the time element is so vital to all members of the electrical industry and to our customers. For instance, the first reason is based on fast changing conditions:

Curtailment of appliance production.
Curtailment of installment buying terms.
Curtailment of new building activities.
Curtailment of new customer activities.
Increased taxes.

Together with rising prices in electrical equipment which are sure to come, these conditions have brought problems and will continue to bring problems. They will create circumstances which will demand a drastic change in thoughts and actions.

They have already caused many "new business" departments to become "old business" departments. They have turned "sales" organizations into "service" organizations. Almost overnight the battle cry has become: "Hold present business—Hold brand preference —Hold service preference."

To better illustrate my point, I will outline briefly what effect these circumstances can have on my own company's revenues.

For example, our company serves 125,000 residential customers who have in use over 1½ million appliances and portable lamps representing an investment of approximately 40 millions of dollars. 350,000 appliances and portable lamps were sold to our customers in the year 1940, representing 9 million dollas worth of electrical equipment. However, about 30% of this equipment, or 115,000 appliances, were sold to replace old electrical equipment consisting of the following:

25,000 radios
25,000 portable lamps
60,000 minor appliances
8,000 major appliances.

The sale of this equipment meant $2,500,000 in dollar volume to the dealer organization, but it also meant the retention of over $600,000 in present actual revenues for our company.

It is our opinion that sales and installations of new electrical equipment will drop 30% to 40% in our territory for the coming year. This will not only limit new business revenues from new equipment installations, but will greatly affect the dealer organizations which we have spent years in developing.

Replacement sales will also drop sharply, but appliance servicing will become a big business or "Old Man Load Mortality" will come in to his own on a scale never before witnessed. We have learned from past experience what a hog he can be. But it is not difficult to imagine what problem he can present when business is exposed to him on such a grand scale with all the odds in his favor.

I mention this because studies and surveys made by one large electric utility revealed that one out of every eight electrical appliances in the homes of their customers need repairs each year under normal conditions.

Applying these figures to customers of our company, it would mean that about 170,000 appliances are in need of repairs each year. They can either be repaired or placed on the shelf and credited to "Load Mortality." This would

*Mr. Keele is resident sales manager for Florida Power & Light Company, Miami, Fla.

add another one-half million dollars in present revenues which would be fully exposed to "Load Mortality" unless effective ways and means are found to counteract his vicious attacks.

Now these were figures based on normal conditions so I will leave it to your imagination as to what the total present revenue exposure to load mortality will be in the near future, taking into consideration that replacement sales will show a sharp decline.

Million Dollar Business

The repair business in our territory will now approach the million dollar mark annually if properly organized.

But what is to happen to trade-in appliances? It is safe to say that not over 25% of them have been rebuilt in our territory in the past. Yet the records show that 71% of refrigerators, 64% of washers, 61% of cleaners, 45% of ranges, can be rebuilt at a profit in normal times. Convenient terms and prices of new equipment have made it unprofitable to rebuild them in the past.

Rebuilt appliances in the future should have a very high resale value, and it is not unreasonable to expect that 70% or more will be rebuilt and put back in service if dealers are encouraged in this endeavor. From the remaining 30%, the usable parts might well be salvaged for use in repair work as it is done in many instances by the automobile industry today.

The rebuilt appliance business is a sizable enterprise in itself and the revenues from it will run into hundreds of thousands of dollars. That the used appliance business is coming into its own can quickly be realized by glancing through articles that have appeared in recent issues of electrical trade magazines.

The second reason why the time element is now so vital is that the saturation of electrical equipment in the home has now reached the stage where it has become of age. The glamorous honeymoon is over. This is evidenced by the steady growth of replacement sales.

The majority of electrical appliances now in use have been installed during the past ten years. The service problem is growing day by day. This is the critical period. Will our customers find a wide selection of appliance repair outlets where they can receive satisfactory service at reasonable cost, or will they find they have been misled and switch to gas, oil, ice, or other equipment which is now more competitive than it was a few years ago?

You know and I know that the competitive major kitchen equipment sellers have been camping on our major appliance users' doorsteps for the last few years just watching for something like this to happen.

Will saturation continue to grow at the same healthy rate that it has in the past? Will we continue to merit the good will and patronage of these customers? I know you will agree that it all depends on how well we of the electrical industry serve them now and in the future.

This all adds up to an enormous undertaking that must be organized with each branch of the industry doing its part for its country's sake, its customer's sake, and its own sake:

We should see that our customers' investment in electrical equipment, which will run into millions of dollars, is protected by providing them with a satisfactory repair service to which they are entitled.

We should first see that the appliance repair and renovating work is shifted to dealers and then assist them in stimulating the business, as this will also be one long step taken toward helping them maintain the necessary revenues to remain actively in the electrical appliance business.

We should see that appliance repair and renovating work is publicized to the maximum degree in order to use every available means of counteracting load mortality and protecting present revenues.

The manufacturers have a dual responsibility to meet in furnishing the necessary appliance repair parts to their dealers so that the users of their merchandise will receive the service for which they have paid and are entitled.

All branches of the industry are equally obligated to see that they meet the customers' needs to the extent that electrically operated equipment remains on the customers' preferred list. When an appliance is placed on the shelf or disposed of for lack of repairs, the customer is deprived of the use of the appliance and the money invested in it, the manufacturer, wholesale and retail dealer lose the customers' confidence and a further source of revenue, the appliance repair dealer loses the revenue that would have resulted from repairs, and the utility loses the revenue which would have resulted from its use and is likely to be criticized since electrical appliances and electric service are all rolled in one as far as the customer is concerned.

The question may now arise: can the dealers successfully handle appliance servicing, and, if so, will they do it?

Many of us were told a few years ago that a much more successful sales job could be done if we developed more sales allies and shifted appliance sales to dealers. This was done and the results have been amazing. Is there any reason to believe that appliance repairs cannot be handled in the same manner and just as successfully?

There are plenty of dealers and others in the territory served by our companies who can satisfactorily handle this business. Many of them are already partially engaged in the business and only need leadership and encouragement from our companies and the manufacturers.

Complicated service problems and a heavy investment in repair shop tools are no longer necessary to efficiently service appliances. The advantages of sealed refrigerator units, adjustable rings for range heating units and standardization of other appliance parts make the job much easier.

Why shouldn't dealers be capable of taking over all appliance servicing? They now sell the majority of all appliances. They can handle it as a major part of their business at a profit, as the automobile dealers have done, because "appliance selling" and "appliance servicing" go together.

At the beginning of the automobile industry, it was difficult to find a sales agency that advertised repair service, but now it would not only be difficult but rare to find one that did not.

For years the leading electrical trade magazines have been telling us that dealers could satisfactorily handle the repair business and have given ample proof that it would work.

Let's get ready now! Let's start reinforcing our defense now to protect present business — business which we have already fought and bled for. It is becoming more precious each day. There was glory in getting it because it was once "new business," but there should be greater glory in holding it under the circumstances.

The husky lad, "Appliance Servicing," stands ready to do his part. He is fast approaching manhood. He is willing to fight "Old Man Load Mortality" for us.

(Continued on page 56)

"Using Users" Sells Attic Fans Without Trial Demonstrations

By Geo. H. Watson

ALTHOUGH no free trial plan has been developed for the sale of attic ventilation, Frederick W. Murray of Douglass & Murray Company, Birmingham, Alabama, believes he has found the nearest approach to it in a plan which makes full use for demonstration purposes of installations in the homes of satisfied users.

Mr. Murray is a partner with Edward T. Douglass in this business which sells 40 to 50 attic fans each season. Fans, stokers and air conditioning equipment are among the concern's specialties.

"I wish it was feasible to install attic fans on approval for the simple reason that there is no better salesman for a fan than the sea breeze comfort it provides," said Mr. Murray. "This is not practical on account of the cost of the installation. But the dealer has another alternative, the use of satisfactory installations to sell others, or in other words, to 'use the user.' We have done that repeatedly and now have sufficient fans out so that they furnish us a constant supply of prospects.

"Here is an actual case showing how it works. One home owner installed an attic fan in his house. He was greatly pleased and spoke so highly of it that his two brothers called on us for similar installations. It is almost a case of mathematical progression as one job begets another, and so on.

"We have owners who permit us to use their installations for demonstration purposes. In fact, we keep a complete list of our best owners, so that prospects may call them up if desired. Also we keep a portfolio of pictures of homes in which we have installed attic fans. All this helps sell."

Both Douglass and Murray are sales minded, and hence devote most of their time to this end of the business and do not let themselves become involved too much in operating and management details of the business. They sell fans and stokers to the same people to whom they sell fuel, and this enables them to dispense home comfort the year around.

Mr. Murray said that in selling fans, the first strategy was to seek permission to go into the home and make a survey to determine the cubical content of the house and therefore the size of fan needed, and also to plan an installation to fit the house. He added that the general rule was to provide an air change for the house every minute.

This concern quotes an overall price for the fan including the installation, but sublets the carpentry and electrical work. Sometimes on a more complicated installation, the carpenter is called in for a bid on that part of the work before an overall bid on the job is given. Mr. Murray said, however, it is helpful if the fan salesman has some knowledge of the carpentry required.

Douglass & Murray handle two lines of fans, one in the low price package field and the other, a nationally advertised fan, for custom-built jobs. Prices range from $130 to $400 with the average installation running from $150 to $200. Some are sold on FHA terms (which are applicable to attic fans), some for cash, and some for payments over a period of about 90 days. Operating costs are so small as to be no deterrent to sales.

"It is absolutely essential that the attic fan be engineered and installed correctly," commented Mr. Murray. "If this is done, then the fan is its own best salesman as I have mentioned. To do otherwise is to kill the goose that lays the golden eggs, because no other prospects can be developed.

"We find that every home owner is a prospect. In fact, our best sales have been to the better class owners of old homes. Some sales have also been made to contractors to go in new homes, but they usually take the less expensive package units. We also sell ventilating fans for commercial establishments. Here the profit motive enters into the deal as a restaurant, beauty shop, or dress shop owner installs a fan so more customers will come in and stay longer. In selling the home owner, the comfort and health angle is uppermost in the sales presentation.

"We find that commercial air conditioning in a sense prepared the way for greater ventilating sales. It was through air conditioning in the larger theatres, ho-

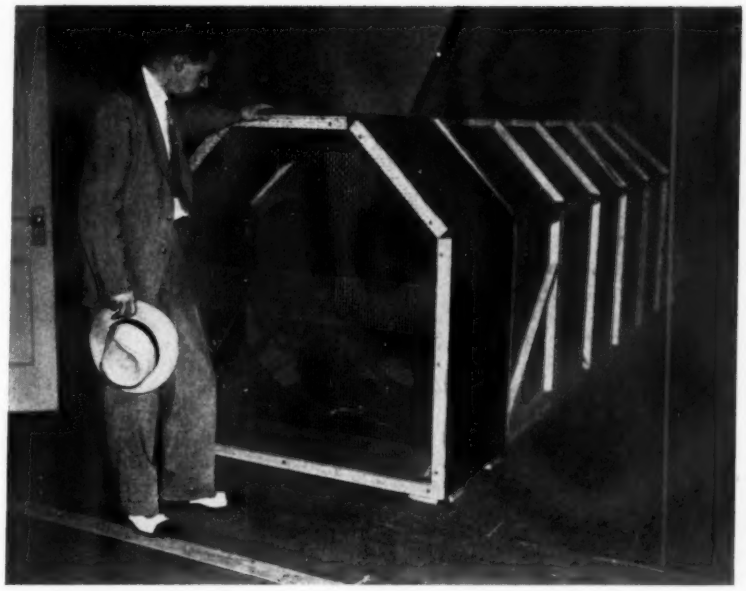
"Package fan" installations such as this one are particularly well adapted to small bungalow installations. A Birmingham home builder uses them to advantage in promoting the sale of his completed homes. The signs used to point out this comfort feature have been instrumental in getting other prospects for the Douglass-Murray Company.

tels, restaurants, and the like that the public became aware that comfort conditions can be provided in the summer time by mechanical means. But people in the South like to keep their windows up in the summer time and the attic fan fits perfectly into that picture.

"There are a lot of commercial places which for one reason or another do not want to make the expenditure for complete air conditioning. It may be that a short lease is involved, or it may be that the type of building is such that economical air conditioning is not feasible. It may be that the customer frequency does not justify air conditioning. Whatever may be the reason, and there are many, these are all good prospects for fan installations.

"Suffice it to say the ventilating fan has really 'come out of the kitchen' and is not being thought of so much today as a mere means of exhausting smoke fumes and odors as a provider of comfort for the home owner or for customers and employees of a business establishment. Proof of this is that we are installing fans not only in homes but in such places as stores, churches, theatres, etc."

In commercial buildings, Mr. Murray said the roof or penthouse job was used quite often. He added that manufacturers furnish literature with illustrations of various type installations and will even make up blue-prints on the more important jobs if desired. The new dealer can soon familiarize himself with this data.



Frederick W. Murray, of Douglass-Murray Co., Birmingham, examines a custom-built attic fan installation made by his company. This fan, which has 16,000 cu. ft. per minute capacity, is mounted on rubber and connected by canvass with the suction box so that no vibration is conveyed to the house frame.

"Lines of Light" for Industrial Plants

(*Continued from page 13*)

ing. The air is distributed through an underground system of concrete pipe having 400 lineal feet up to eight feet in diameter. This has been laid in the ground and covered by the fill underlying the concrete floor.

Ducts leading directly from this network of pipe have been brought up alongside the first floor columns with outlets about two feet above the floor at each level. Used air can be either washed and recirculated through return ducts to the central system or exhausted through windows by 36-inch ventilating fans of 15,000 cfm. capacity above the main manufacturing area. Air from bakers and from the coating room all on the first floor is exhausted direct to the outside by a network of overhead ducts.

All the service facilities required for the distribution of gas, compressed air, combustion air and power for lighting, manufacture and lamp testing have been carried direct to equipment locations throughout the plant, for maximum safety and convenience in operation. A loud speaker system with 22 outlets in various manufacturing departments is used to carry musical recordings throughout the plant and serves to break the monotony of repetitive work.

Included among the plant's modern facilities are cafeteria and kitchen, which together occupy an area 60 feet by 80 feet; a large conference room; a dark room for taking photometric measurements and other photographic work; physical and chemical testing laboratories; a large engineering department, cost accounting and private offices. All of these quarters are situated along the front of the building which is of two- and three-story construction on either side of a 4-story entrance tower.

The offices of Henry F. Callahan, plant superintendent, and other production executives directly overlook the main manufacturing area on the second floor, while those of Dr. R. M. Zabel, manager of lamp engineering and manufacturing, are in the tower.

A large maintenance shop completely equipped; a pump room, where air compressors, special controls for regulating pressure of incoming gases and other equipment, are located; as well as a boiler room which contains two 150-horsepower stoker-fed boilers and a small hot water heater, are in a wing adjoining the main manufacturing area.

Power enters the plant through underfloor ducts and is distributed from three independent transformer stations alongside the plant. Power is transformed from 2,400 volts to 115 volts for lighting which requires 500 kva. Additional power is required to serve a large bank of machines on which fluorescent lamps are subjected to life tests on various circuits. Power required for general manufacturing is transformed from 2,400 volts to 230 volts for operating purposes.

The exterior of the plant is as representative of modern factory design as the lamps which it produces. Red face brick has been used with limestone trim across the facade.

Dealers Facing New Conditions With Merchandise Diversity

WITH THE prospect that the volume of appliances available will become considerably smaller in the next few months, appliance dealers are making plans to supplement their new major appliance stock with reconditioned equipment, small appliances, and even "side lines."

* * *

Now that deliveries of major appliances have been seriously curtailed, Herndon Ellis, manager of the Ellis Company, in Ensley, Alabama, has turned to the following merchandise: small appliances, phonograph records, lamps, flashlights and linoleum.

Even before the needs of national defense caused a curtailment in the production and delivery of major appliances, Mr. Ellis put in one of the most complete displays of small appliances to be found in the city. He figured that this would build traffic for his store and tide him over the ups and downs, seasonal and otherwise, in the sale of major appliances.

Of course, priorities may hit the small appliance business, also, but Mr. Ellis doesn't anticipate that it will be to the same extent as in the case of major appliances.

Also he stocked linoleum, at least he keeps a half dozen samples on hand with a book containing other styles and colors. Thus when a customer is buying a refrigerator or range it may be that she is planning to modernize her whole kitchen, so that the sale of the linoleum can be added very easily. The salesman can easily remind her of this need. The store also carries kitchen cabinets and this helps to build up the size of the kitchen appliance sale and thus maintain volume.

In phonograph records, Mr. Ellis finds he can do a volume of some $150 per month with a nice net profit on this. Even at that he carries only a small stock, but he makes special orders where desired. He got into the record business more or less by accident, first giving a record as a souvenir to customers each time they made a payment on a combination radio and phonograph machine.

In flashlights, only a token stock is carried, but it will bring in a gross business of $150 to $200 per year.

The lamp department has been materially increased and includes a "light conditioning center" which is proving quite a money maker. Mr. Ellis is of the opinion that a lot of electric shops may be overlooking a bet in not featuring lamps and light globes, in fact, a complete assortment of lighting fixtures which may readily be sold over the counter.

In small appliances, Mr. Ellis' best single seller is pressing irons, with sales totaling some 400 to 500 per year, and that is a lot of irons. The price range is $1.95 to $9.95, with the higher priced irons selling best. Other best sellers in the order named are percolators, waffle irons, toasters and hot plates.

* * *

C. E. Vallentine, owner of Home Appliance Company, Texarkana, Arkansas, added a comprehensive stock of wallpaper and paints.

One entire side of the store was devoted to the new department, and because of the necessity of conserving space, a compact and effective method of carrying and showing paper stocks was devised. That side of the store is arranged as a mass display of different patterns of paper, and stocks are carried right behind the samples.

This requires a depth of but little over 18 inches, so that actual floor area used is not so great. A series of 138 compartments was constructed for the paper. Solid partitions were not necessary, framework at bottom, top and sides for each space being sufficient. Each space is the width of a roll of paper. There are six spaces in height and 23 in width, giving the total of 138. Each holds one bolt of paper.

In front of each bin is a sample of the paper it contains. The sample was pasted on a piece of 28-gauge galvanized sheet metal, cut to proper size, fastened at top with two hooks so that it can be raised easily or even removed, to permit entry to paper back of it.

One of the Ellis Company windows, in which small appliances are featured. Roasters, electrical heaters, vacuum cleaners, and other small appliances are making up much of the volume lost in major appliances.

With deliveries of major appliances curtailed, Herndon Ellis, of Ellis Company, Ensley, Alabama, has turned to small appliances, lamps, phonograph records, linoleum and kitchen cabinets as sidelines to replace the volume he expects to lose in major appliances. The attractive small appliance department is shown partially, as Mr. Ellis discusses an appliance with a customer.

A strip of border is pasted across top of sheet. In order to have neat appearing samples, a paper hanger was employed to paste the samples to the sheets of metal.

Shelf brackets were put about six feet above the floor, on which a roll of paper can be placed and unrolled to the floor, to give the customer a better view of the pattern. Several rolls can be stretched out at the same time to show comparison.

Reserve stocks are kept in another part of the store, at rear. The entire investment in both wallpaper and paints will run from $1,500 to $2,000, Mr. Vallentine said.

* * *

One of the most unusual side lines for an electrical appliance dealer, an assortment of greeting cards, is to be found in the The Electric Shop, of El Dorado, Arkansas. A thriving business is done in this so-called novelty, and A. D. Andrews, the proprietor discloses that there is money "in them thar greeting cards" in more ways than in just the profit in them.

Mr. Andrews says that when a greeting card manufacturer's salesman visited him about five years ago and suggested the line, he told the man he was "just nuts," that those things didn't belong in an electrical contractor-dealer's store. The salesman was persuasive, his proposition sounded reasonable, the investment was small, and business at the moment in contracting and merchandising was slow. Result: a small order for greeting cards.

But that investment, which today doesn't average much over $500, has increased store business by at least 400 per cent, Andrews says. The profit on cards more than pays the rent—and he is in a high-rent location.

One wall of the store, about 40 feet with a depth of 2½ feet, is devoted to greeting cards, displayed on slanting cases. They must be well displayed, said Mr. Andrews. No use to carry even the largest stock if the cards are put away in drawers, out of sight.

Another advantage of this line, strange as it is to the electrical business, is that it has increased store traffic, sales of lamp bulbs, small appliances, lighting fixtures and gift merchandise.

* * *

Supplementing small appliances and electrical merchandise in the store of El Dorado Electric Company, El Dorado, Arkansas, is a good assortment of gift goods in pottery, wood, glass, etc. Attractive displays are arranged in the recessed spaces along one wall, and in half-round, three-step fixtures, as well as on the main display cases and tables in central part of store. Lamps and electric appliances are also kept in the recessed cases and displayed along with gift goods.

The business is owned by Mr. and Mrs. I. G. Pockrus, and the gift merchandise end of it is largely the responsibility of Mrs. Pockrus. She does the buying and watches movement of goods.

Being located between the city's two leading hotels, the store gets a good deal of drop-in or tourist trade. The out-of-town people like to pick up a little native pottery, and also buy other items for souvenirs, Mrs. Pockrus said.

Investment in gift lines is but a few hundred dollars and a fairly representative assortment is maintained, much of the pottery coming from factories located in Arkansas. Buying is done largely at the Dallas (Texas) market where two large gift shows are held annually.

Incandescent Lamps For Dallas Store

(Continued from page 21)

The third floor, containing ladies' dresses, coats, hats, furs and ready-to-wear, was remodeled from an architectural standpoint. A combination of fluorescent and incandescent lighting was used. All the incandescent is recessed and excellent results achieved with direct-type prismatic lenses. They are all set flush with the ceiling and spaced symmetrically in order to assure uniformly good coverage.

On that floor, at points where the traffic is most dense, there are open niches for displays of dresses or furs. Out in front of these displays are recessed spotlights in the ceiling, with ball-and-socket construction so that they can be changed to any angle and light the object to a high intensity.

All show windows were remodeled and rewired, using special fixtures designed by Eleanor LeMaire of New York City. Here they got away from the standard show window type of light and reflections. A new and novel arrangement for lighting was achieved by a drop ceiling in which large port holes were arranged over the window proper. Reflector lamps were mounted above these port holes at a height sufficient to be out of the line of sight completely, thereby concealing entirely the light sources.

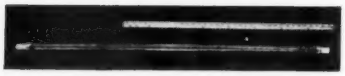
PRACTICAL HELPS for the TRADE

Contractor - Dealer - Motor Shop

3 Kw Mercury Lamp Now Available to Industry

Hailed by lighting experts as a distinct contribution to greater speed in war industries and to other manufacturing plants, the largest and most powerful mercury lamp in the world, was announced at Nela Park laboratories in December by General Electric's Lamp Department.

Designated as the 3,000-wattt G-E Mazda "AH-9" mercury lamp and rated at 120,000 lumens, this long tubular light source is eight times more powerful than the present largest lamp of its kind.



Yet its 55-inch length is only four times that of its nearest rival, a 400-watt mercury lamp, rated at 16,000 lumens, chief source of illumination in many factories today. It measures approximately one inch in diameter.

Nela Park engineers believe the "AH-9" mercury lamp will be a boon for the lighting of steel mills, foundries, erecting shops and for other large areas where lofty mounting heights of luminaires are required. It is regarded as a "natural" wherever swift and accurate human seeing is a vital factor in speeding up production.

Trial installations have proved that these streamlined AH-9 mercury tubes — in good reflectors and on conventional spacing centers — can provide more than 50 foot-candles of light evenly over the working plane.

The new 3,000-watt G-E Mazda AH-9 mercury lamp has several outstanding advantages. Obviously, the reflector and transformer equipment required for best operation of a single AH-9 is considerably smaller in bulk and less in cost than the aggregate equipments needed to produce a like amount of light from a system of eight or nine 400-watt mercury tubes in separate fixtures. Cost of servicing a single large unit, the engineers point out, will be considerably less than the expense of maintaining a group of smaller fixtures burning less powerful lamps.

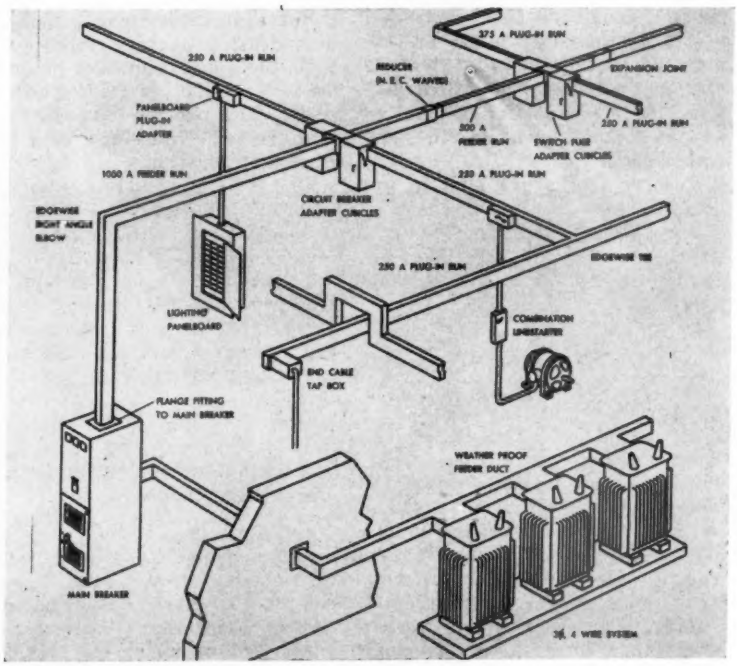
The new 3 KW G-E Mazda AH-9 mercury lamp generates more than twice as much light per watt as do filament sources commonly used, produces about one-third the radiant heat per foot-candle, permits higher levels of illumination from present wiring, and emits a light that is both actually and psychologically cooler than the light from tungsten filament lamps.

In shape, construction, and somewhat in principle, the new G-E 3,000-watt Mazda mercury lamp resembles G-E's 100-watt Mazda fluorescent lamp.

Shop Lights Controlled By Phototube and Lamp

Enterprising electrical contractors may find profitable sales opportunities in the harnessing of photoelectric control equipment and street lights for the control of window lights in business establishments.

The "electric eye," used for years to count traffic, open doors for busy waitresses, sort coffee beans according to color and do a dozen or more other jobs which previously had to be done by hand, has just come into a real wartime



BUS DUCT FOR INDUSTRIAL POWER—This cut-away view shows how modern bus duct, or bus way, can be formed into industrial secondary power distribution systems having many advantages over conventional wiring methods. Composed of copper busses in a dust-tight metal enclosure, a wide range of sizes and types of fittings are available, facilitating flexible design. (Westinghouse photo.)

Based on the fact that street lights are turned out immediately during black-outs, this photoelectric control operates night lights in shops or stores, thus permitting night operation of show windows, etc., without employing a nightwatchman.

occupation, that of standing by as all-night guard for alert warnings of possible air raids. Focused on the street lights, which will be turned off the instant a warning is received in any city, the "electric eye" sounds an immediate warning and likewise turns off the lights in the home, store, display signs or wherever lights are to be extinguished to perfect a city blackout.

The idea originated in a small machine shop in Schenectady, N. Y., which is engaged in wartime defense orders. When war was declared, orders were issued to all people, including business houses, that lights must be extinguished within five minutes after an air raid warning. Since the shop was too small to afford an all-night watchman, the photo tube control was developed to operate the lights. It was installed at a window on the second floor, with the eye pointed toward the street light on the corner, and adjusted so that whenever the street light went out, all lights in the shop would go out. When the street lights came back on again, on would go the all-night lights.

The electric eye equipment cost about $30. It cost $10 more to install it, so for an expense of less than $50, an all-night guard on the lighting of the plant was provided.

The set-up could be used by merchants who can not afford an all-night watchman. Since the war, these merchants have been turning out their lights when they close their places of business at 6 o'clock at night, and thus have sacrificed whatever advertising might come from window shoppers during the evenings.

How Other Men Manage

(Readers are cordially invited to make use of this department as a means of obtaining information on the problems they encounter in their work. Your questions will be identified only by a number. All readers having information on the questions asked are invited to submit answers. In sending answers, please refer to contributor's number published with the question. Payment of $3 each will be paid for all questions or answers published. Address your communications to the Editor, ELECTRICAL SOUTH, 1020 Grant Building, Atlanta.)

Can You Supply Answers To These Questions?

Contributor No. 1015: *"We are wondering what other motor shops use for cleaning off commutators after they have been soldered. We use acid for soldering and alcohol to clean it off afterwards. With the price of alcohol increasing, we are wondering if someone else has found another satisfactory neutralizing agent."*

* * *

Contributor No. 1027: *"I am endeavoring to find a simple means of determining the polarity of transformer windings, for use especially with relay and metering potential transformers. I have been told that there is a relatively simple method making use of direct current for the test but have been unable to obtain information on how this test is made. Your assistance on this will be appreciated."*

Answers to Questions Published Previously

Contributor No. 1018: *"I want additional information on glass fiber tape for coil insulation. Can you advise me as to types and sizes available?"*

Answer: There are three different grades of glass tape. These are divided into two groups depending upon type of yarn used. Then one grade of these two groups is again divided into two types depending upon the weave.

There is the staple yarn tape and the continuous yarn tape. Then there is the close or tight weave and the standard more closely woven or medium weave tape.

The staple yarn tapes have a fuzzy appearance and are made only in the .010", .015", .020" and .025" thicknesses, and are made in the medium weave. These tapes are designated by the symbol ESS-13-A.

The continuous yarn tapes are the ones used mainly in coils and windings. There is the medium weave that can be had in .003", .005", .007", .010", and .015" thickness and designated ECC-11-A.

The tight weave tape is obtainable in .003", .005" and .007" thickness and designated ECC-11-B, (the B indicating tight weave).

For example, the .005" thick tapes both use the same basic yarn, ECO 450 2/2, but the ¾" wide "A" weave has 32 ends and 35.1 picks per inch, while the ¾" "B" weave tape has 39 ends and 38.6 picks per inch.

Much time can be saved and lamp breakage averted by the use of a display rack which keeps the bulbs separated, yet permits ready reading of the wattage marked on the end of the bulb.

Such a rack may be built by stretching one-inch mesh chicken wire on a light frame, preferably mounted on casters. The one-inch mesh is just right for lamp bases.

Interim Amendment Gives Approval to Parallel Wires

An interim amendment to the 1940 edition of the National Electrical Code approves the paralleling of conductors in sizes 1/0 to 500,000 cir mils, inclusive.

Conductors within this range of sizes may now be run in multiple provided they are of the same length, have the same circular mil area and type of insulation, and as few conductors as possible for the type insulation used.

Such conductors run in multiple must terminate at both ends in pressure connectors so arranged as to insure equal division of the total current between all conductors involved.

Methods of Protecting Commutator Vee-Rings

By A. C. Roe

On all types of commutators, the front mica vee ring is exposed and should be insulated to prevent the entrance of dirt, dust, oil and other foreign matter. Also, when the armature has Class B insulated windings, the front vee ring insulation should consist of similar materials. In fact, for general maintenance work, it would be good economics to standardize on a high gloss finish, Class B insulated, front vee ring protection.

The Class B insulation used on the front vee rings consists of either a glass sleeving or tape, together with cements and varnishes. The cost of the material and labor for the best vee ring insulation is small compared to the total cost of the complete armature and protection obtained.

There are a number of methods that can be used to insulate vee rings but this discussion will be restricted to six of the most commonly used methods. The first four methods are used with Class A insulated windings, while the fifth and sixth methods are for Class B windings.

Methods one, two, three and five involve the application of running bands by rotating the armature, while methods four and six are applicable to large armatures that cannot be easily rotated. They can also be used on smaller armatures when a tight and thicker layer of insulation is desired.

Before applying any new vee ring insulation, the old insulation should be removed down to the mica, then the mica surfaced, smoothed off by rubbing with No. 00 sandpaper, all dust blown off, and a coat of shellac (such as Westinghouse No. 1103) applied immediately and allowed to air dry.

(1) Twine, shellac and cement are used in the first method, and provide a simple and effective means of securing protection. The procedure is to apply a coat of shellac, then wind on a layer of twine into the wet shellac, apply the twine tight and smoothly in layers. Loop the starting end under the band and pull the finish end under the band with a loop formed by the starting end. (See Fig. 1.) Coat the surface of the twine with shellac and allow it to air dry. Then brush on one coat of red oxide enamel (such as Westinghouse No. 672-1).

(2) Shellac, twine, shellac and cement are used in the second method and provide protection in the form of a well-bonded, hard, glossy finish. First coat the mica with shellac (No. 1103) and while still wet apply a string band of a soft material such as four-ply Italian twine. Wind it tight and close in layers and lock ends as in method No. 1.

Then brush on a coat of shellac and iron it in well with a hot soldering copper. Apply a second coat of shellac and iron it down also. Sandpaper this surface to a smooth finish, then apply at least two coats of No. 672 cement. Allow the first coat to air dry at least one-half hour before applying the second coat. If more than two coats of No. 672 red oxide enamel are applied, the succesive coats should be sandpapered smooth to obtain a hard glossy finish.

(3) Shellac, twine, shellac and varnish can be used with armatures that are also dipped in varnish and baked, or where a hard high gloss finish is required. This method is the same as the second method up to the last coat of iron-

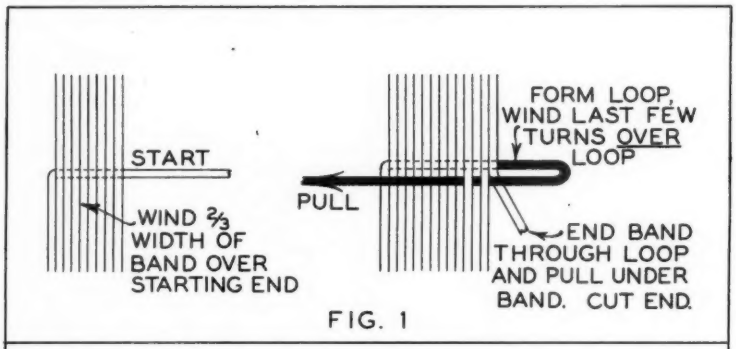

START
WIND ⅔ WIDTH OF BAND OVER STARTING END
PULL
FORM LOOP, WIND LAST FEW TURNS OVER LOOP
END BAND THROUGH LOOP AND PULL UNDER BAND. CUT END.

FIG. 1

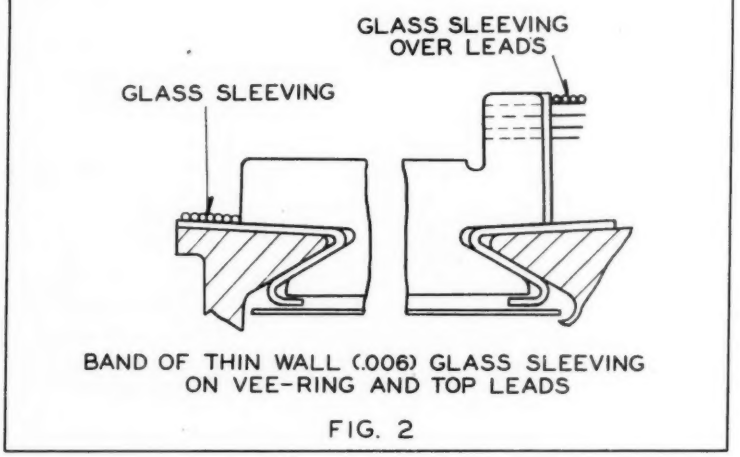


FIG. 2

Fig. 1. Method of winding twine on commutator vee ring to prevent entrance of oil, dirt, etc. Fig. 2. Use of glass sleeving and cement on commutator vee ring for same purpose.

ed-in shellac. The red oxide enamel is omitted and the vee-ring is given five coats of a clear thermo-setting varnish, used at a high specific gravity (app. .900).

Bake each of the first four coats for at least two hours at 130-140 degrees C., and the last coat 16 hours. This means a total of 24 hours baking but when armatures have been rewound and are being dipped and baked, the armature can be removed for short intervals for the varnish coats.

This method is the best one for Class A insulated windings as it provides a hard, thick glossy finish with maximum protection.

(4) Tape, varnish and cement is a combination that can be applied to vee-rings without the necessity of revolving the armature. First soak a roll of .020″ thick x 1″ or 1¼″ wide surgical (cotton) tape in a clear thermo-setting varnish. Then clean the mica with No. 00 sandpaper, blow off all dust, coat the mica with the thermo-setting varnish, and apply three layers of the tape. Half overlap each layer, and brush on varnish between layers of tape. Sew the ends of the tape to the next layer. To prevent fraying of the outer edge, sew all around the exposed end using a lock or chain stitch. This locks the layers together and prevents their being separated by windage, etc.

Bake the armature until the varnish is dry, sandpaper the surface smooth, then apply three coats of No. 672 red oxide cement, sandpaper the second coat and allow each coat to air dry at least one-half hour.

(5) Glass sleeving and cement are used in the method shown in Fig. 2. It should be used for all armatures that have Class B insulated windings and that can be rotated.

Smooth the mica vee-ring with No. 00 sandpaper, blow off all dust, and apply a coat of 1103 shellac. Then while the shellac is still wet, apply 1/16″ inside diameter .006″ wall (ECB) glass sleeving as a string, loop the ends to fasten the band, and wind it on tight, smooth and in close layers. Brush on one coat of 1103 shellac, allow it to air dry, then brush on three coats of No. 672 red oxide cement. Sandpaper the second coat of cement.

This method can be used in place of methods 2 or 3 on Class A insulated windings if maximum protection is desired.

When ordering the glass sleeving be sure to specify the .006″ thick wall and the ECB grade sleeving. This is stronger and more flexible than glass string for vee-ring protection.

(6) Glass tape, varnish and cement are materials that should be used on large armatures that have Class B insulated windings, and as a substitute for method No. 4.

First smooth the mica surface with No. 00 sandpaper, blow off all dust, and apply one coat of a

(*Continued on page 55*)

Electrical Publications Of Interest to the Trade

Practical Electrical Wiring

By H. P. Richter. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York City. Illustrated 513 pages. Price $3.

This second edition of this practical electrical publication has been produced to keep the subject matter in conformity with the National Electrical Code. This edition is based on the 1940 edition of the Code.

Covering residential, farm and industrial wiring, it presents practical methods of wiring in language that can be understood easily by the practical electrician. Although it is simple enough for beginners, the book completely covers the field and forms a convenient reference book on electrical fundamentals, terminology, basic theory, and practical wiring methods.

* * *

Fluorescent Light and Its Application

By H. C. Drake and Jack De Ment. Published by Chemical Publishing Co., 234 King Street, Brooklyn, N. Y. Illustrated. 256 pages. Price $3.

This is a comprehensive, authoritative publication on fluorescent light and its applications. The aim of the authors has been to group material by chapters so as to cover the interests of a wide range of readers and applications.

The scope of the book is indicated by the chapter headings: Historical Aspects of Luminescence; Methods of Examination; Sources of Ultraviolet Radiations; Fluorescent Minerals; Radioactive Minerals; Luminescence of Gems; Notable Fluorescent Collections; and Uses of Ultraviolet Light.

While this book covers the fundamental and theoretical considerations upon which all commercially available fluorescent lamps are based, it should be pointed out that this is not a text book on the design and application of fluorescent lamps.

* * *

Electricity in the Home And on the Farm

By Forrest B. Wright. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City. Illustrated, 372 pages. Price $2.75.

The plan of this book is such as to make it of special value to the beginner in electrical work. For apprentice training courses it should prove particularly satisfactory.

The book is divided into two parts each comprising about half of the total number of pages. Part 1 consists of a series of practical jobs arranged in order of difficulty. The purpose of this section is to teach the student to learn by doing and to use the tools and materials of the electrical trade. Part 2 deals with the fundamentals of electricity explained in easy to understand language. The theoretical section is most complete extending through elements, d-c and a-c theory and equipment, to the practical aspects of wiring and equipment installation.

* * *

Electrical Illumination

By J. O. Kraehenbuehl. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City. Profusely illustrated, 441 pages. Price $3.75.

Just off the press, this comprehensive publication of lighting will prove of practical value to the reader interested in the principles underlying the specification and design of electrical lighting for commercial and industrial buildings.

No attempt has been made to treat every type of installation and equipment, but only the important principles that govern lighting practice. In addition to several chapters devoted to fundamentals of lighting practice, the book includes chapters on light sources, light control, general illumination design, luminous architectural elements, floodlighting, novelty lighting, maintenance and economics, and wiring. A most important feature of each chapter is bibliography on the subject covered by the chapter.

The last two chapters on maintenance and economics and wiring alone are worth the price of the book. As a whole, the book comprises a convenient reference work that should be on the bookshelf of every lighting man.

INDUSTRIAL ELECTRIFICATION
Installation and Maintenance

Infra-Red Drying Lamps Helpful to Motor Shops

By A. C. Roe

Small, medium and large repair shops are finding that radiant heat drying lamps can be used in many ways to speed up the baking of armature and stator windings. In fact the smaller shops will find radiant heat lamp drying of more importance than large shops who have a number of armatures and stators baking at one time.

The construction of the baking tunnels or frames is simple and the combination and adaption are unlimited and depend on each operator's skill and shop conditions.

Regardless of how generated or applied, heat serves the purpose of increasing the temperature of the object or materal being processed. There are a number of ways in which heat may be generated, but only three ways in which it may be transmitted from its source to the object or surface being heated, namely: conduction, convection and radiation.

What is Radiant Heat?

A bar of iron held in a flame soon becomes heated for its full length, although only a small part of the bar actually may be in contact with the flame. The heat is transmitted by being conducted through the bar. Heat by conduction requires a solid.

Heat of convection requires a liquid, air or some other gaseous atmosphere for transmission. The usual type of gas-fired or steam-heated oven transmits heat by convection. The air within the oven is heated and in turn heats the surface or object with which it comes in contact. When the temperature gradient between the air and the object is great, the rate of transfer of the heat is rapid, but this rate decreases rapidly as the gradient decreases.

Radiant heat requires no liquids, solids, or gases for its transmission. The energy of the sun is radiated through the millions of miles of cold between it and the earth. Likewise, radiant heat as used for industrial purposes is transmitted from its source direct to the surface on which it falls with no useless or wasteful heating of the surrounding atmosphere.

The infra-red incandescent filament lamp used for commercial heating and drying processes converts some 90% of the energy consumed into heat, most of which is in the infra-red portion of the spectrum. Hence it is a very efficient and convenient form of infra-red or radiant heat generator.

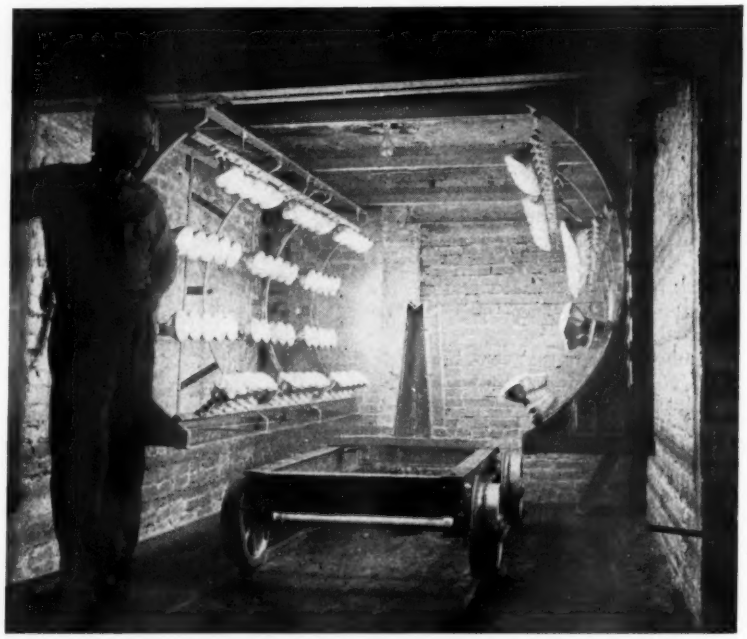
Advantages of Radiant Heat

Low Initial Cost. Since infra-red heat is radiated directly from its source to the object being heated with no dependence upon air as a medium of transmission, no elaborate insulated ovens are required.

Speed. Radiant heat penetrates the surface finish or film of a surface causing more rapid heating and drying. Greater speed plus lower installation and maintenance costs have resulted in lower total processing costs in many drying and heating applications.

Ease of Control. Radiant heat being of the same general nature as visible light is as easily controlled and redirected. A flip of the switch and the heat is there in full force with no delay.

Flexibility. Temperatures may be controlled or varied by the simple expedient of turning on or off more lamps. The change in temperature is almost immediate.



One motor repair shop has obtained excellent results with this bake oven which it converted from gas fired heat to infra-red radiant heating lamps. The lamp banks can be adjusted in distance from the center of the oven and group control of lamps permits flexible use. Typical of time saved with new oven, an eighteen inch rotor that formerly required from 30 to 36 hours for drying can now be dried in 7 to 8 hours.

	Diameter of Armature or Stator to be Dried			
	Up to 6"	7" to 12"	13" to 16"	17" to 24"
No. of Lamps:	2	4	8	8
Time in Hours:	1	1¼	1½	2

In contrast, ovens have a considerable temperature "lag," which means a loss of time when it is necessary to change temperatures.

Convenience. The lamps and the supporting structure being of light weight, the smaller installations may be made portable and hence moved from place to place as needed.

Adaptability. Processes or space limitations requiring vertical ovens sometimes present difficulties in the usual methods of heating because the convection currents rise to the top of the oven, making it difficult to maintain a uniform temperature at both the top and the bottom of the ovens. This difficulty is largely eliminated when radiant heat is used. Here the heat is directed onto the surface being heated, and the temperature of the surrounding atmosphere has less influence on the temperature of the surface.

Compactness: Usually a radiant heat installation occupies less floor space than the conventional oven required for the same process. In some cases the lamps may be suspended from and mounted near to the ceiling, thereby releasing the floor space below for other purposes.

Drying Small Motors. One shop recently installed an adjustable tunnel using 2 to 16 lamps, each rated at 250 watts, in gold plated reflectors, and reported drying times as tabulated above.

Thus combinations of lamps, diameter of rotor or stator, type of varnish and depth of windings must be considered but there is no doubt that drying can be speeded up.

Converting Large Oven

Another large repair shop converted the large oven shown in the illustration from gas fired to radiant heat lamp drying. This oven uses 120 type R-40, 250-watt lamps. The racks are hung on rollers at the top of the oven so that each side can be adjusted towards the center of the oven. Note that the lamps are arranged in 24 circuits with 24 switches, thus each circuit has five lamps. In the photo, all 120 lamps were turned on while the photograph was taken. Note absence of glare, etc. One can walk into the oven and examine an armature that is being dried with infra-red heat, without discomfort.

The following data provides comparative drying time between the old oven and the new infra-red heating:

A six inch armature which required approximately 24 hours to dry, is now dried in 4 to 5 hours with 15 lamps.

A ten inch rotor which required 24 hours now can be dried in 4 to 5 hours with 40 lamps.

An eighteen inch rotor that formerly required 30 to 36 hours now can be dried under radiant heat in 7 to 8 hours with 40 lamps.

Thus eight rows of five lamps each, arranged at 45 degree angles apart around the armature, does a quick baking job, and it can be checked without fear of losing heated air as would be the case when an oven is opened.

This brief data indicates that small shops should check up on what radiant heat lamp drying can do for them. The editors will gladly furnish names of equipment manufacturers.

Industrial Applications of Infra-red Heating Lamps

The application of infra-red lamps to industrial heating and drying operations of various kinds has progressed rapidly during the past year. The advantages of this type of drying and heating over other types are numerous and the following are typical applications for which infra-red lamps are particularly suitable.

1. Drying finishes on metal.
2. Drying finishes on wood.
3. Drying finishes on paper.
4. Drying finishes on rubber and on plastics.
5. Expanding gears and bearings for shrinking on shafts.
6. Drying ceramics.
7. Paper dehydration.
8. Drying latex.
9. Drying glue.
10. Drying photographic prints.
11. Multiple uses in the preparation of food products.
12. Heat-treating tobacco.

The following case histories are typical of the industrial heating application problems which may be solved with the infra-red heating lamp.

1. In a Chicago plant three rows of eight lamps each are used to heat large sheets of insulating material so that they may be cut into narrow strips without breaking. The strips are again heated with one row of lamps prior to a punch press operation.

2. A lithographing company, in Pittsburgh, had trouble due to curling and wrinkling of paper which caused excessive spoilage. Prevention of this spoilage was expensive and included among other things air-conditioning of the entire plant. The paper is now conditioned with a few 250-watt lamps and gold-plated reflectors.

3. In another plant, an infra-red lamp equipped oven using 210 kwh per day is used to dry steel spring chairs for infants. It is 15½ feet long and cost $4,500 complete with conveyors. A conventional furnace to do the same job would have cost $11,000 and would have been 120 feet long. The infra-red oven does a fast job and does not draw temper of the springs. It starts instantly in the mornings and can be shut down without loss or delay for noon hour.

4. A battery of infra-red drying lamps are used in another plant to supplement a high temperature gas-fired oven used to fuse the special paint on bottle labels. The lamps have eliminated the "bottleneck" created by the slowness of the oven and have made it possible to so speed up the conveyor that the bottles now can be processed as fast as the labels are applied. Owner says installation cost $165 and saves him $18 per day.

5. Eight infra-red lamps were used for drying small armatures in an electric refrigerator maintenance and repair shop.

6. Another application of infra-red lamps is for pre-drying of black enamel applied to automobile lamp bulbs prior to fusing of

the enamel to the glass in a high temperature, gas-fired oven. Formerly, after spraying, the bulbs were allowed to air dry approximately two hours before processing in oven. Installation of ten lamps over the conveyor, with a drying time of one minute, has made it possible to process the bulbs as rapidly as the enamel can be applied. This has resulted in reduced cost, increased production and a product of better quality with fewer rejects.

7. Four drying lamps are used on a conveyor line dryer for drying the enamel filling applied to "on" and "off" lettering on wall switch handles as rapidly as it can be applied by the operator. This installation is typical of the simplicity and speed of radiant heat drying.

8. An injection molding dryer using ten drying lamps removes moisture from granulated cellulose acetate prior to loading in press. This material readily absorbs moisture which, if not removed, would cause a film on the surface of the molded part as there is no means for escape of the moisture in the automatic injection type press. This method of drying which requires 15 minutes, replaces a steam dryer in which the drying time was approximately one hour.

9. Another installation used twelve 250-watt, drying lamps for drying tracing reproductions, transparent contact prints, van dyke or brown prints, etc., and has produced such gratifying results that . . . "It has been decided definitely to use this means of drying exclusively, primarily because it is the only drying process we know of whereby distortion can be reduced to an absolute minimum. It is our intention to use these lamps in our photographic section for drying contact and bromide prints," the plant operator reports.

10. In a shop where fine furniture is repaired, radiant heat has greatly reduced the cost and the time required. In most cases, several refinish coats are used. It was the former practice to allow each coat to dry over night. Now approximately 30 minutes are required. The advantages are obvious. The lamp racks may be adjusted for the proper distance from the surface being dried.

11. Although only four infra-red lamps are used in another installation the radiant heat produced is said to be sufficient to greatly minimize the trouble due to offset and static formerly experienced on a small printing press.

12. Another unit employing 23 250-watt drying lamps is used for drying of "strip" film by the Pittsburgh Press. Speed, uniformity of drying, cleanliness and automatic operation are the reported advantages of radiant heat over oven heat formerly used.

13. Infra-red lamps used for drying iron castings molds formerly dried with kerosene torches. With lamps on six-inch centers and six to ten inches from the surface, the molds dry to a depth of approximately one inch in 45 minutes. The principal advantages of radiant heat are: better uniformity and lower cost. Cost of drying with this new method is reported to be from one-fourth to one-half of the cost of drying with torches.

Biggest Fluorescent Job in Vega Factory

The new $7,000,000 factory of the Vega Airplane Company, located at Lockheed Air Terminal, in Burbank, California, is said to have the largest installation of fluorescent lights in the world. One hundred per cent fluorescent lighted, the Vega plant, in which there are 1,256,491 square feet of working space, contains 36,524 tubes, which, if placed end to end, would measure 27¾ miles, approximately ten miles farther than its nearest rival. These tubes are contained in 10,392 fixtures designed by Vega engineers.

In the huge manufacturing building alone there is a vast unpartitioned ceiling 11½ acres in expanse, measuring 600 feet by 850 feet, which dazzles the imagination as well as the eye with 17,894 tubes in 4,470 fixtures. These lights cover 510,000 square feet of working space, an area big enough to hold ten football fields, including the end zones.

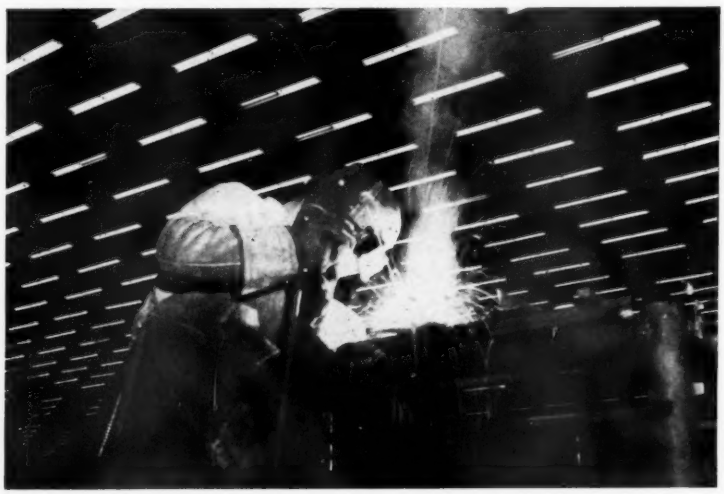
In addition to this, the mezzanine ceiling in this great room contains 5,246 tubes in 1,423 lamps, giving the entire room light from 23,140 fluorescent tubes. The mezzanine, 197,000 square feet, would hold four football fields. Including both main floor and mezzanine, the manufacturing building covers 16 acres, all under one roof.

The installations above the final assembly section of this building are the highest fluorescent mountings in existence, being 40 feet above the floor at some points and 35 feet high at others.

Power for these thousands of lights is distributed through eight sub-stations. There are from four to eight transformers in each.

Vega engineers estimate the total wattage to be 1,460,960.

Since the Vega plant joins the Lockheed Air Terminal on the South, it was necessary that a carefully planned system of obstruction lights be installed. Plant protective lighting consists of a series



Record for the largest fluorescent lamp installation in the world is claimed by Vega Airplane Company, of Burbank, California. Lighted one hundred per cent with fluorescent lamps, the plant includes 1,256,491 square feet of working space and contains 36,524 fluorescent tubes. The lamp tubes would extend 27¾ miles if placed end to end.

system similar to that used in street lighting, and a system of flood lights for the inner areas.

All lighting circuits are balanced so far as is possible on a three-phase, four-wire, 120/208 volt system. The three-phase, four-wire system has many advantages for all types of lighting, but it is especially desired for fluorescent, since it practically eliminates all stroboscopic effect.

Capacitors Pay Cost In 14 Months Savings

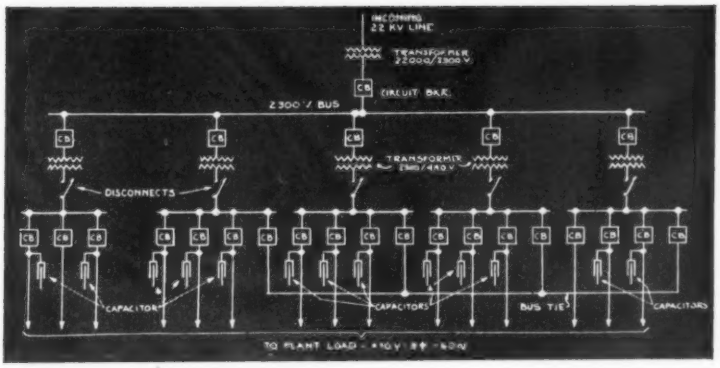
At the end of their first fourteen months of operation, a group of sixty 15 kva capacitors installed at a southern ore refinery sliced $6,900 off the plant's power bill, raised a power factor of 78 per cent to a near unity value of 92, and in the short time of only fourteen months have completely paid for themselves.

The refinery is entirely electrified, using squirrel-cage induction motors, for the most part, to drive the various equipment. The loading of these motors, due to the nature of the product handled averages about 66 per cent of their full load rating giving rise to low operating efficiencies with consequent low power factor and heavy lagging currents. The operating power factor of the plant before the installation of capacitors was 78 per cent.

Power was purchased at 2200 volts from the local utility and was reduced at the plant to 440 volts in their own substation. Charges were based on a monthly kva demand, plus an energy rate. Energy in excess of 250 kwh per kva of billed demand was obtained at a rate of 1.5 mills less than the standard energy rate.

The company management, realizing that raising the plant power factor would increase the number of kwh obtainable at the lower energy rate, and at the same time, reduce the kva demand, decided to install capacitors.

Sixty capacitors, each unit rate 15 kva at 460 volts were installed in distributed banks, one bank to each feeder supplying a low power factor load. The capacitors are in the circuits continuously being switched out only at infrequent intervals for inspection.



This one-line diagram shows location of capacitors. Sixty 15-kva 460 volt units were installed and remain in feeder circuits continuously.

Results of the installation were noticeable immediately. Load currents on the capacitor equipped feeder circuits dropped. The plant power factor rose from a comparatively low 78 per cent to a near unity value of 92 per cent with a corresponding elimination of useless wattless current. The existing feeders are now capable of carrying enough added load to permit a sizable plant expansion, if and when it should be needed.

Most important, however, was the effect of the capacitors on the power billing. With their elimination of wattless current, the monthly power bill for the first year's operation averaged $575 less than previously. This represents a yearly saving of $6,900 in power costs.

The first cost of the capacitors approximated $7,800. Slightly more than this amount has been saved in 14 months of operation, so that the capacitors have literally "earned their own keep." Since installation, no maintenance or repairs have been necessary.

Individual capacitors for feeders were installed in this southern ore refinery, the units being mounted directly over the switchboard.

Economical Maintenance Of Fluorescent Lamps

For dependable and economical fluorescent lamp operation, the following requirements should be observed: (1) Provide means for access to fixtures for cleaning and relamping. (2) Use fixtures designed for easy cleaning and relamping. (3) Provide in advance for the replacement of lamps that are to burn out. (4) Use the group replacement plan for fixtures that are difficult to service.

NEWS of the INDUSTRY
National and Southern

Modern Kitchen Bureau Revises 1942 Program

The national advertising program on electric ranges sponsored by The Modern Kitchen Bureau has been cancelled owing to exigencies of war and the probability of increased supply difficulties, it was announced recently by C. J. Coward, chairman of the Bureau's Range Advertising Committee, and advertising manager, Kelvinator Division, Nash-Kelvinator Corporation.

Educational work on the electric range, as an efficient method of protecting natural food elements during the cooking process, and as a time- and labor-saver for American housewives in the emergency period, will be continued through the Bureau's over-all operations. "It Happened in the Kitchen," the Bureau's full color talking motion picture, and several mailings of packages of ideas for complete advertising campaigns stressing the "Gain Through Use" advantages of the electric kitchen and its appliances, designed for use by utilities, will help to keep the idea of electric cooking alive in the public mind.

This material will consist of layout and copy suggestions on different advertising themes in keeping with the times, and suggestions for displays, posters, direct mail, radio commercials, etc., for well-rounded local programs to be mailed at intervals through the year.

The electric kitchen and electric water heater programs of the Bureau will continue as originally planned, according to W. A. Grove, chairman of the Bureau's Plan Committee and advertising manager, Edison General Electric Appliance Company.

Electrical Supplies Provided for by OPM

Assurance that adequate quantities of plumbing, heating and electrical supplies will continue to be available through usual wholesale and retail channels, is given in a program announced recently by the Priorities Division. Under it, householders, farmers and businessmen may look forward to well-lighted and well-warmed quarters during the coming months.

Manufacturers of essential types of supplies will be given priority assistance in obtaining the necessary materials, within the framework of the Production Requirements Plan. They will not, however, be required to prove deliveries under rated orders, where the supplies are to be sold to ultimate users not customarily assigned preference ratings.

A manufacturer wishing to qualify for the preference ratings available under the program should make application on form PD 25a, addressed to the Production Requirements Branch, OPM. If approved, he will be granted priority assistance in securing materials in amounts which will be determined after consideration of the importance of the particular product, amounts previously manufactured, the recommendations of the appropriate industry branches of OPM, and other similar factors.

Also a part of the program is Suppliers Order M-67, addressed to retailers, wholesalers, jobbers and all other distributors of these supplies. To assure an equitable distribution of these items, essential to public health and welfare, it establishes maximum inventory levels and prevents the accumulation of excess stocks at any stage of the distribution process.

The new program does not affect the provisions of Preference Rating Orders P-100, P-46, P-56, P-68, and other repair and maintenance orders issued on behalf of industry.

Engineers' Spring Meeting Will Be Held in Raleigh

The dates of March 12th and 13th have been set for the spring meeting of the Engineering and Operation Section, to be held at the Sir Walter Hotel, Raleigh, North Carolina, with the Carolina Power and Light Company as host, according to announcement by John W. Talley, executive secretary, Southeastern Electric Exchange.

An interesting program is being developed under the direction of Chairman Lewis Payne which will reflect engineering and operating procedure under war-time conditions. Program details will be announced later and in the meantime, hotel reservations should be made directly with the hotel.

Restrictions Imposed On Lamp Industry

Seeking to save large quantities of nickel, brass and copper, the War Production Board ordered sharp curtailment in the use of these critical materials for manufacture of non-essential incandescent lamps.

During February, March and April, consumption of nickel, brass, copper or any other metal for lamps designed primarily for use on Christmas trees or for advertising, decorative or display purposes, must be reduced by 50% each month below consumption during 1940.

Effective February 1, no manufacturer may use any materials obtained before or after that date with the assistance of any preference rating to produce Christmas tree, advertising, decorative or display lamps.

In addition, Limitation Order L-28, imposes general restrictions on the lamp industry. During February, March and April, use of nickel in the production of lamps must be reduced by 25% below 1940 consumption, the use of brass must be cut by 20%, and use of copper, by 20%.

These reductions, it is expected, probably will be absorbed in elimination of non-essential lamps. Through substitution of less critical material and more economical use of the allotted critical materials, the industry undoubtedly can meet all essential industrial and civilian needs.

Industrial Conservation Objectives Announced

The Bureau of Industrial Conservation of the OPM has worked out a program of objectives in connection with its comprehensive plan of industrial conservation designed to obtain the active cooperation of industry in the economic use of raw materials and the salvaging of scrap needed for America's war industries.

The program of objectives is as follows:

The wrecking of abandoned and obsolete machinery and equipment.

Utilization of all critical materials to the best advantage.

Re-use, wherever possible, of blanks, cutdowns, short-ends, clippings, etc.

Selective handling and segregation

of scrap and coverage at the source.

Avoidance of contamination.

Speeding the return of scrap and waste materials through existing channels to mills and refineries.

To carry out these aims and objectives, the Bureau of Industrial Conservation recommends the following salvage procedure and methods:

(a) Arrange in every plant for the appointment of a "Salvage Department Manager" or for the delegation of some one individual in each plant to be responsible for the wrecking of obsolete machinery, equipment, etc.

(b) Arrange to train men, if necessary, in the definition of scrap, its nature, its handling and its salvage.

(c) Arrange for a system of periodic reports (weekly reports are considered desirable on scrap collected) to be made by every plant to the Executive Committee.

The Bureau of Industrial Conservation plans to assemble and keep all records of scrap collected and salvaged by all plants and report to the OPM.

The Industrial Salvage Section of the Bureau of Industrial Conservation has offered to make available the services of an experienced salvage engineer for consultation on specific problems, to supply figures and salvage consultants for important meetings, and to serve as a clearing house for information on plans and procedures which have proven practical and profitable in other industries. Posters, displays, notices, press releases and other material will also be supplied.

EEI Commercial Activities Geared to Victory Program

Announcement of a policy to direct commercial activities of Edison Electric Institute definitely toward a Victory Program, and reorganization of committees to this end was made by C. W. Kellogg, president of that organization.

How to use electricity in industries so as to speed maximum, efficient production without waste, and to improve quality, will be studied by one of the committees. This committee will also study how to build up system load factors to reduce peak loads and losses on utility systems.

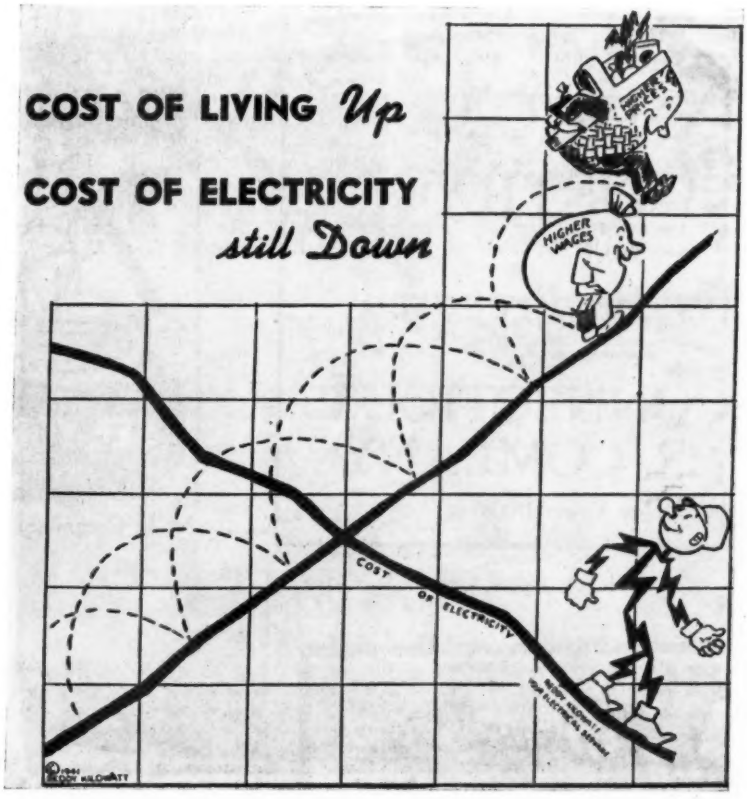
The Institute will give continued assistance to the Sub-Contracting and other divisions of OPM.

Under the broad objective of winning the war, commercial studies will aim to stimulate the service phases of utility company operations and to foster a type of advertising which will stress such use of present equipment as will insure a minimum requirement of critical materials. Committees will encourage the repair of present appliances and major equipment so that customers' devices may continue serviceable. Cooperation with other branches of the electrical industry concerned with sales and service of appliances will be sought.

The graver needs that confront the nation affecting both home and industry will require better lighting arrangements. Broader opportunity is given for committees to continue study of lighting applications in industry to increase output, improve products, decrease work and conserve eyesight.

A home service committee will study kitchen rearrangement for labor saving and meal planning to meet the increasing cost of living, while maintaining the maximum nutritive values of food. A farm service committee will study methods and equipment which will give maximum increase in farm production, relief in farm labor requirements and minimize loss in perishable food products.

Committee studies are to be organized also along the lines of research and planning for the post-war period when intensified sales efforts must be relied upon to cushion the economic shock at the termination of the defense program.



ELECTRICITY COST-TREND DOWNWARD — The Oklahoma Gas and Electric Company used this illustration of Reddy Kilowatt to emphasize the fact that power remains "at the same low cost as during the pre-war period."

Cleaner Production Curtailed 25% to 40%

Cuts ranging from 25 to 40 per cent in production of domestic vacuum cleaners during the first quarter of 1942 were ordered in January by Donald M. Nelson, Director of Priorities.

During January, February and March, Class A manufacturers whose average monthly factory sales in the 12 months ended June 30, 1941, were 5,200 or more units, will be required to curtail output 40 per cent below the monthly average. Class B manufacturers, whose average was less than 5,200 units, must cut production 25 per cent.

Under the original curtailment program, which ran from October 1 to December 31, 1941, Class A firms were cut only 10 per cent, while Class B companies were restricted merely to 100 per cent of their base year production rate.

Two other orders affecting consumers' durable goods were issued at the same time by Mr. Nelson. One simply excludes from existing production quotas any domestic mechanical refrigerators produced for United States government agencies, allied governments, lend-lease requirements, and for defense housing projects where contracts involved were ob-

tained as the result of competitive bidding.

The other order provides similar exemptions and extends through the first quarter of 1942 the curtailment program on use of steel in the manufacture of domestic (non-mechanical) ice refrigerators. During January, February and March, steel consumption is cut 40 per cent below the monthly average used in the 12 months ended June 30, 1941, or in the three years ended June 30, whichever is the fairer base period.

Under the original program, running from September 1 to December 31, 1941, use of steel in these ice boxes was curtailed 35 per cent.

Lowell Thomas Reports On the Power Industry

"The Conquering Kilowatts" is the title of an unusual advertisement which appeared in the January 24th issue of Saturday Evening Post and the current issue of **Electrical South,** over the signature of the Johns-Manville organization. Designed to help inform the public of the indispensable part America's basic industries are playing in our Victory program, the advertisement is one of a series featuring articles by such well-known commentators as Lowell Thomas, Frazier Hunt, and Fulton Lewis, Jr., the only reference to Johns-Manville being a brief sponsorship note.

As the title would indicate, the current advertisement deals with the part the power industry is playing in this great national effort. "Doers —Not Talkers" is Lowell Thomas' comment on the power men in this interesting analysis of the power industry's part in the Victory Program and its ability to do that part.

"Here is an industry that was really ready for National Defense," reports Mr. Thomas. "Electric power is now driving 86 per cent of the factory wheels of America. And almost nine-tenths of this vast power mechanism was built and operated by private enterprise, seeking an opportunity for profit, in the matchless American Way. In that search were developed new uses and new markets for power, new comforts and standards of living for Americans, at ever higher efficiency and with ever lower cost. Backed by the savings of millions of small investors, private industry has marshalled the peacetime kilowatt forces into an army more than adequate to America's production needs in a war-time emergency."

Commercial Meetings Sponsored by E.E.I.

Announcement that the commercial forces of Edison Electric Institute will convene at Chicago again this spring for a General Power Conference will be gratifying news to the industry. This follows the announcement of the Statement of Commercial Policy by the Institute, and the adjustment of committee structure for assistance to a Victory Program.

The dates set are March 24th, 25th and 26th, at Edgewater Beach Hotel, Chicago. The Conference will be preceded by Committee Day on March 23rd.

Tentative plans provide for the elimination of sectional conferences. There will be general sessions only, all of which will be open to manufacturers and others interested in electric service supply.

There are numerous problems confronting commercial departments of the power companies in serving homes, commerce and industry during the emergency to be discussed, and these meetings will afford opportunity for contributions to the furthering of the war effort.

Kentucky Inspectors Meet in Louisville

Electrical inspectors of the Kentucky Chapter, I.A.E.I., and the contractors affiliated with them, held their fourteenth annual meeting in Louisville, January 29th and 30th.

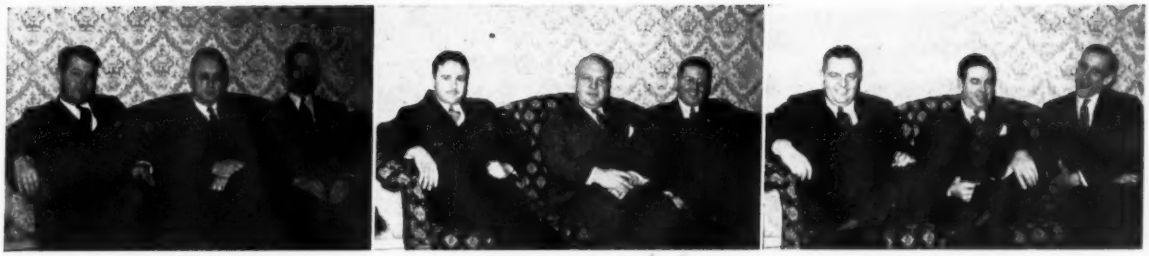
Among those who participated in the program were G. A. Swain, of N.E.M.A., who talked on "State Electrical Legislation Activities." Other speakers and their subjects were V. H. Tousley, national secretary of I.A.E.I., "Code Problems"; O. K. Coleman, American Gas & Electric Co., "Adequate Wiring"; R. E. Barry, of Louisville, and W. H. Waller, Hopkinsville, "Promoting Electrical Inspections Throughout the State"; H. C. McDaniel, Westinghouse Lamp Division, "Black Light"; and E. G. Romeiser, Porcelain Products, Inc., "Harnessing a Giant with Insulation."

McCall Named President Of New Orleans Assn.

A. J. McCall, Graybar Electric Co., New Orleans, was elected president of the Electrical Association of New Orleans at its recent annual meeting held in the Jung Hotel.

Other officers elected are: J. Otto Kaelin, executive vice-president; S. L. Drumm, vice-president wholesalers, utilities, mfgrs., etc.; L. F. Murphy, vice-president refrigeration; J. J. Friedler, vice-president air conditioning; Henry Muller, vice-president electrical contractors; Geo. J. Segel,

NORGE DISTRIBUTORS IN DETROIT—Norge distributors from all over the country arrived in Detroit early in January to see new Norge products and discuss sales promotion plans for 1942. The distributors came in small groups, each group staying two days. Characteristic of the attitude of all the distributors was an enthusiasm for the products coupled with a very sincere and real desire to place the interests of the Victory Program above everything else. Center of much interest was the new service program presented to distributors by service manager, Jack Tenney. Typical scenes at the meetings are shown above. (Left) Norge washer sales manager, Ed Kanker goes over the situation with P. A. Seaton, Sr., and sons W. E. and P. A. Jr., all of B. T. Crump Co., Richmond, Va. (Center) W. C. Rowles, Norge Southwest Sales Co., San Antonio, Texas, and Norge's electric range sales manager, Art Kitson, look over a deep-well cooker. (Right) This discussion took place between E. D. Hanley, Birmingham Electric Battery Co.; Norge chief engineer, H. H. Willingham; W. D. V. Hopkins, Hopkins Equipment Co., Atlanta; and Norge executive vice president, R. W. Gifford.



HYGRADE REPRESENTATIVES MEET — Southeastern representatives of Hygrade Sylvania Corp. held a two day meeting in Atlanta in January. Among those in attendance, shown in the photos above, were: (left) Lad Snowden, Chattanooga; Robert M. Rausch, Southeastern division manager, Washington, D. C.; and Morris Bartlett, Asheville; (center) Gene Underwood, Richmond; Aksel Knudstrup, division engineer; and Bill Hanna, fluorescent promotion representative, the latter two both of Washington, D. C.; (right) Brad Jones, Baltimore; Ralph Turner, Jacksonville; and Hugh Saussy, Atlanta. Sales promotion plans for 1942 were discussed.

secretary; I. W. Tufts, treasurer, and W. E. Clement, director of publicity.

Changes in the Board of Directors were also made in the election of J. P. Maguire to succeed W. J. Amoss; Frank Paeske to succeed J. T. Dupree; R. M. Salvant to succeed C. L. Osterberger; Fred Sockton to succeed C. W. Schweers and A. G. Riddick, ex-officio. Hold over members of this board were Messrs. Aleck Mattes, E. N. Avegno, and J. N. Roos.

Georgia Illuminating Engineers Meet

The conditions facing illuminating engineers in 1942 were discussed by J. M. Ketch, of General Electric Co., Nela Park, at the mid-winter meeting of the Georgia Chapter, Illuminating Engineering Society, January 23, in Atlanta.

A special feature of the Georgia Chapter's meetings now is a study club conducted in round table fashion which precedes the regular meeting. At the last meeting the subjects for study and discussion was "Lighting Large Factory Areas with Fluorescent Lamps." James F. Whitehead, Jr., chairman of the chapter, presided over both sessions.

Industrial Activity At High Point in Alabama

Industrial activity in Alabama for the year 1941 reached the highest peak in the history of the state, according to the annual report issued by the University of Alabama Bureau of Business Research.

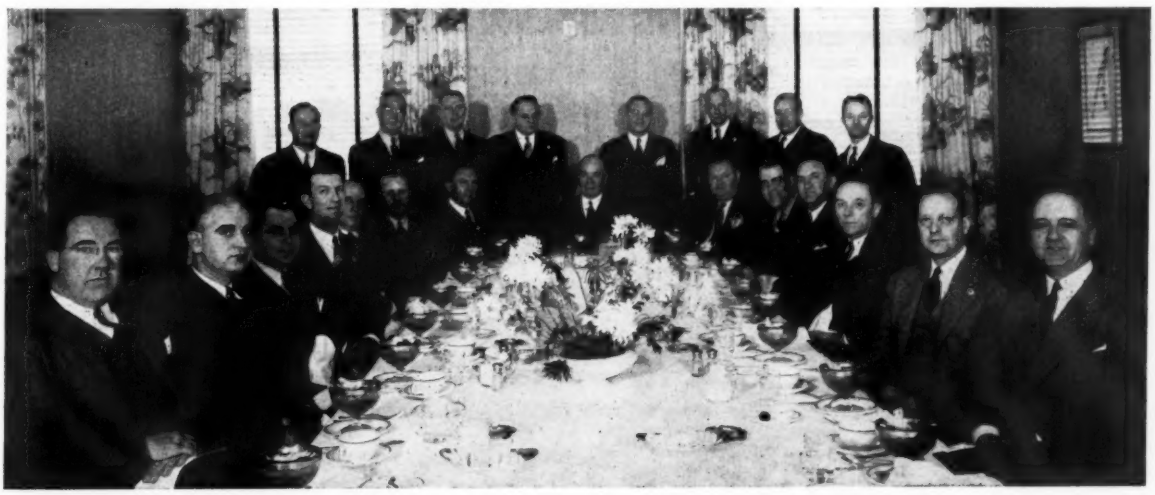
First to be stimulated by the demands of the defense program was the heavy industry of the state as it geared itself for war production. The year 1940 might well be characterized as one of recovery for heavy industry but by 1941, Alabama industry had passed from the "recovery" stage to that of "prospering" and the composite index for the year rose to new heights.

The composite index entered 1941 at 160.1 per cent of the 1935-1939 activity and reached the peak for the year in July, 180.9 per cent. Since July it has fluctuated close to 173 per cent, but a further substantial rise is expected.

Sales of electric energy followed a steep course upward since 1938. This year's sales for both industrial and non-industrial purposes set an all-time high in spite of the drouth. The 1941 index for total electric energy consumption for Alabama has jumped from 161.6 per cent in January to 207.6 per cent in October.

Reclaimed Rubber V-Belt Manufacture Announced

America's refrigerators, washing machines, oil burners and other appliances, which last year required 22,000,000 replacement V-belts, will not break down for lack of new belts if military requirements will permit use of reclaimed rubber.



ATLANTA EXECUTIVES HEAR GEORGE HUGHES — Some twenty electrical utility and wholesale executives of Atlanta were the guests of Hotpoint Company recently to hear an informal address by George Hughes, chairman of the board, Edison General Electric Appliance Co., on the conditions facing the appliance industry in the coming year. Mr. Hughes is shown seated at head of table. Standing, at his left, is H. K. Dewees, district manager.

If results of the OPM's study of the over-all rubber situation permit, the B. F. Goodrich Company is putting on the market Victory V-belts made entirely of reclaim rubber which will give 80 per cent of customary service without drawing on the nation's crude rubber stockpile, it was announced in Akron by William S. Richardson, general manager of the Industrial Products Division of the company.

"This development would contribute toward maintenance of civilian morale by permitting continued operation of appliances while conserving rubber vitally needed for war equipment," Richardson said. "Last year, 2,325,000 pounds of natural rubber went into replacement V-belts for automobiles and 2,260,000 pounds into replacements for domestic appliances," he added, emphasizing that the government's ruling limiting the use of natural rubber does not provide for the manufacture of any V-belts, either for original equipment or replacement purposes.

Left, the Dolly Madison Seven, leader of the 1942 Westinghouse refrigerator line. Right, two True-Temp ovens for extra baking and roasting and double broiling capacity are features of the Westinghouse Regent model, leader of the company's 1942 electric range line. Single dial oven heat controls set the temperature and turn on heat.

1942 Appliance Lines Announced by Westinghouse

Maintenance of standards and quality in refrigerator equipment of American kitchens has been accomplished by Westinghouse in the company's 1942 models, according to T. J. Newcomb, manager of the household refrigeration department, Mansfield, Ohio, yet their manufacture makes thrifty use of critical metals and other materials in demand for wartime needs. To conserve time and equipment during the emergency period, the usual extensive re-tooling of production machinery was not undertaken. The 1942 line has been confined to six models, four of seven cubic foot size and two of nine foot size, as compared with fifteen last year.

In achieving the design and engineering which the 1942 line represents, Westinghouse "know-how," the ability to apply special skills and technique to production problems, was called into emergency use. In some cases, Mr. Newcomb pointed out, the changes involved actually are providing improved performance. At the same time, it has been possible to introduce several new features and to extend the wide-range True-Temp control system to the entire line.

Full-size evaporators will be provided for all models for 1942. The meat keeper and crisper compartments are retained, and a new storage bin, which opens outward without the necessity of opening the refrigerator door, makes its bow.

A "control center" for electric cookery has been built into the 1942 Westinghouse electric ranges. Dials and switches of the new models are grouped in a readily accessible control area, on the left back panels away from surface units.

"Ease of operation and appearance were foremost in our minds in 'tailoring' the ranges to the standards of today's women," R. M. Beatty, range department manager, said. "The 1942 back panel design meets both requirements.

"Westinghouse engineers worked out this and other improvements in the ranges by adapting present manufacturing facilities to the job. To conserve materials and machinery for wartime needs, we did not undertake extensive re-tooling of range manufacturing equipment."

On two models of the seven offered for 1942, the cooking surface is illuminated by a 20-watt fluorescent lamp, an efficient and economical light source. The lamp is concealed, set in a cowl formed by the upper portion of the range back panel.

Features of the 1942 ranges include the Single Set switch for automatic surface cooking, Corox five-speed surface units, and roomy ovens with automatic controls.

Informative labels are affixed to every range and refrigerator as it leaves the factory. The labels, which describe the construction and performance of the appliances, were introduced by Westinghouse in 1941. They were reported by dealers to be a real aid to women purchasing kitchen equipment. In view of this, Westinghouse has made the labels a permanent part of its presentation of merchandise.

In summing up the future plans of the Westinghouse merchandising division, Mansfield, Ohio, Frank R. Kohnstamm, sales manager, reports that every facility of the division is being geared to the country's war economy. His statement follows:

"The Westinghouse plants in Mansfield and Springfield, Mass., are at work on contracts exceeding $25,000,000 for essential war materials. More vital production will be assigned to the two factories.

"The future output of electric household appliances and other products in these merchandising division plants will depend upon the amounts of material and effort which can be given over to durable consumer goods during the emergency. Wartime needs must come first, but civilian goods must follow.

"Westinghouse quality standards will not be relaxed. Our engineers have worked with two thoughts in mind, to clear the road for defense and to make it possible to continue the manufacture of electric appliances. They have carried on a continuing program of developing suitable substitutions as the supplies of vital materials become critical.

"Our advertising and promotion plans for 1942 are designed to keep consumers thinking about electrical living and Westinghouse appliances, even though many purchases will have to be deferred until peace comes.

"In planning such a program, we have shifted the emphasis from individual product advertising to a broader story explaining the advantages of our appliances to the consumer. Such subjects as Westinghouse Informative Labels, our service policy, our Quality Control system, will be stressed and interpreted in terms of the appliance purchaser.

"There will, of course, be advertising on the individual appliances, including refrigerators, electric ranges, irons and roasters.

"Now, more than ever before, the servicing of existing appliances should be maintained at the highest possible level. If the public cannot buy all the appliances that they could in normal times, they naturally will have

SETS A NEW STANDARD
in Safety Switch Design

THE NEW *Vacu-Break* SAFETY SWITCH

Note streamlined appearance, and push-type, front-operated rocker handle inside cabinet lines. Below: New Type Arcing Chambers are attached to Overhead Brackets that fit horn side on the operating lever which transmits an over-center, straight line, push-and-pull motion to switch contact heads.

Cut-away view of new formed bakelite arcing chamber shows how snugly the clamping pressure contacts fit therein.

WITH "*Clampmatic*" CONTACTS AND FRONT-OPERATED ROCKER HANDLES

Get acquainted with the quality switch of the day — the new BullDog Vacu-Break Safety Switch. This new switch, with its "clampmatic" contacts and front-operated rocker handles sets an absolutely new standard in safety switch design.

The handsome, streamlined appearance of the new Vacu-Break Switch; its new, simplified operating mechanism; its perfect clamp pressure yet almost automatic ease of operation; its new, push-type rocker handle inside cabinet lines; all combine to offer you something unique in switch design and in performance.

The new *"Clampmatic"* Clamp Pressure Contacts, and the new snap spring Rocker Handle of the *push* type, assure perfect clamp pressure of the switch contacts while in the ON position combined with almost automatic ease in "making" or "breaking" the circuit.

Write for complete illustrated Bulletin No. 415.

OUTSTANDING FOR ITS EXTREME SIMPLICITY OF DESIGN

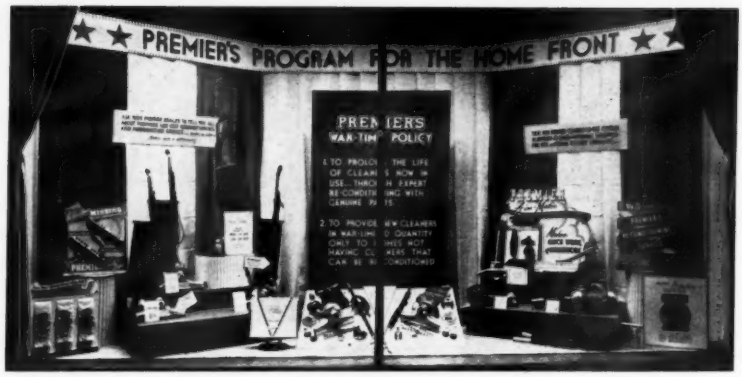
BULLDOG ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN

BULLDOG ELECTRIC PRODUCTS OF CANADA, Ltd.
TORONTO, ONTARIO

MANUFACTURERS OF Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems—FOR LIGHT AND POWER

Above: Two views of a 200 amp. Switch Head with bakelite cover removed, illustrating the "Clampmatic" principle of pressure contacts.

to make their appliances last longer. Accordingly, we have redoubled our efforts to assist dealers in solving service problems. The headquarters service department has been expanded. A service training program has been launched, dealing not only with the mechanical side of service but with those 'little things that count' to make appliance users happy and satisfied. The Beacon, a Westinghouse magazine edited for service men, has been enlarged and made more stimulating."



PREMIER WINDOW DISPLAY—Premier's "war-time policy" was the theme of this window display exhibited during the entire month of January in Cleveland in cooperation with the Electrical League of Cleveland. The window featured prominently this two-point policy: (1) to prolong the life of cleaners now in use through expert reconditioning with genuine parts; and (2) to provide new cleaners in war-limited quantity only to homes not having cleaners that can be reconditioned. The window displayed corresponding new and worn parts, the point-of-sales displays available to dealers to promote service, and the new war-limited line of new cleaners.

Frigidaire Cold-Wall Models Announced

Improved facilities for the better preservation of food in the home were emphasized in a recent announcement of new 1942 Frigidaire Cold-Wall Refrigerators by E. G. Biechler, general manager of the Frigidaire Division of General Motors Corporation. This announcement follows introduction of the new Frigidaire Standard models as reported last month.

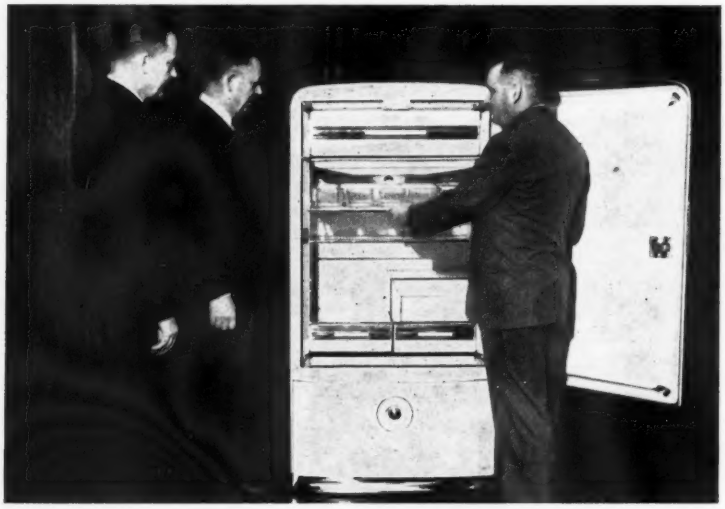
In commenting on the new models, Mr. Biechler again emphasized that every Frigidaire resource is pledged to an all-out war effort. "We do not know how many refrigerators we are going to build," stated Mr. Biechler, "however, I can say that every product delivered to dealers will be a good one and we will ship as many as we can without interfering in any way with our strenuous war efforts."

P. M. Bratten, general sales manager, stated that the complete Frigidaire line now includes five fewer models than last year. The new Cold-Walls are available in two sizes—the CD-7, being provided with exterior finishes of either Dulux or Porcelain and the CPD-9 in Porcelain only. In addition, the two-door 13½ cu. ft. Cold-Wall model of last year is being continued practically without change.

To meet a rapidly growing demand for frozen storage facilities, the Super Freezer Chest has been redesigned to provide greatly increased capacity. Actual increase over comparable models last year is 20% in the CD-7, and 40% in the CPD-9.

Another noteworthy feature of the new Cold-Walls is the completely redesigned Dew-Fresh Seal for control of moisture within the cabinet.

The new Frigidaire Cold-Walls also have 16-way convertible interiors made possible by newly designed shelves. This wide choice of arrangements makes these models suitable to any family's needs for any season of the year.



P. M. Bratten, Frigidaire general sales manager, and E. R. Godfrey, asst. general manager, are watching S. M. Schweller, chief engineer, slide out the convenient shelf designed to hold the new uncovered glass dish and egg basket set found in Frigidaire's Cold-Wall CPD-9 model for 1942. This unique feature takes advantage of the fact that in Cold-Wall models no waste space is needed between dishes since the compartment is cooled by chilling coils in the walls instead of by air circulation.

Service Plan Announced For Refrigeration Industry

Two new service programs—for refrigeration and air conditiong equipment—were recently announced by Philco Corporation. Patterned after Radio Manufacturers Service in many respects, Philco executives anticipate that the new service plans will become as important to the refrigeration and air conditioning industry as RMS is in the field of radio.

First step in putting the service programs into operation will be the selection of service men or service organizations having the equipment and experience necessary to qualify as authorized Philco Service Stations. Detailed applications must be filled out and approved by the home office in Philadelphia and no application will be approved until a personal inspection has been made by a Philco distributor's service engineer.

Since it is anticipated that the servicing of all Philco refrigerators and air conditioning equipment in the country will be done eventually by this group, its members are being selected with great care. Only servicemen well qualified by training and experience will be accepted.

Authorized Philco service stations

Porcelain Products, Inc.

ELECTRICAL PORCELAIN · SINCE 1894

CABLE ADDRESS: PORCELAIN
CODES: L CODE, ABC 6TH ED.

FINDLAY, OHIO · U.S.A.

PLANTS: PARKERSBURG, W. VA.
FINDLAY, OHIO · CAREY, OHIO

AN OPEN LETTER

TO ALL ELECTRICAL CONTRACTORS:

Porcelain Wiring Systems will help beat Hitler and the Japs. This is not a quip but the solemn truth.

Let's have a little straight thinking on this subject. It is asserted on the highest authority that America will win this war through super-production and conservation of critical materials. Mr. Donald Nelson of the new War Production Board says -- "We can't waste anything". Senator Truman's investigating committee points out the dire urgency for stopping waste and extravagance.

PORCELAIN WIRING conserves desperately needed STEEL, COPPER, RUBBER, ZINC and PAPER. PORCELAIN WIRING means KNOB and TUBE Wiring with PORCELAIN OUTLET BOXES. The potential savings reduced to pounds and tons are almost unbelievably immense and, interpreted into guns, tanks, and armor, take on a new and very significant meaning -- a challenge to the Electrical Industry.

All this does not stop with a mere gesture of patriotism. The service record of Porcelain Wiring over the past half century is its own best proof of Economy, Efficiency, Permanence, and Safety. We assert without reservation that Knob and Tube Wiring, properly installed per Code, is the safest of all recognized methods of wiring. For verification check Underwriters' reports on electrical fires and accidents.

Porcelain Knobs and Tubes INVOLVE NO CRITICAL OR SCARCE MATERIALS, except a relatively insignificant quantity of nails. We believe that the merest common sense leads to the inescapable conclusion that the efficient prosecution of our war effort places Porcelain Wiring in predominance over all other known methods.

The time is short. The urgent need for material reinforcements for American men and boys fighting against medieval barbarism in the far corners of the earth compels the Electrical Industry to re-value present existing wiring methods in light of common sense.

PORCELAIN PRODUCTS, INC.

PORCELAIN PROTECTED WIRING SYSTEMS SAVE VITAL METALS

in both the refrigeration and air conditioning fields will receive without cost a steady flow of service bulletins from the home office describing details of installation, operation and other technical information essential to general service. Meetings will be conducted for members by the Philco Field Service Engineers to introduce new models and to explain design, engineering, operation and servicing. Authorized service stations will be given a service certificate to be displayed in the shops, and every man on the service staff will receive an identification card. Philco distributors' service and parts department will act as local headquarters where first hand information and parts will be readily available.

With the formation of service programs for refrigeration and air conditioning, Philco now offers four service plans to the home appliance industry. Radio Manufacturers Service, which in a few years has built up a membership of 30,000, has been of tremendous influence in improving service standards in home radios and auto radios.

McGregor's, Inc., Completes Extensive Remodeling Program

McGregor's, Inc., Memphis, electric appliance distributors for the tri-states, have just completed the remodeling of their spacious showrooms, redecorating the entire showfloor with a color scheme in three tones of blue. This unique treatment of an appliance display floor has created much favorable comment by visitors and has been very effective in more attractively displaying their products.

Night view of McGregor's, Incorporated, Memphis, Tennessee, one of the South's largest distributors of electric appliances. The firm recently remodeled and installed new lighting fixtures and a 35 foot neon sign which draws the attention of night traffic to their beautiful displays.

The addition of a three-colored neon sign 35 feet in height has done much to draw the attention of night traffic to the beautiful display which McGregor's maintains at all times.

McGregor's, Inc., was founded September 19, 1919, by John M. McGregor, who is president of the company. Herbert S. Hobbs, vice-president in charge of sales, has been identified with the appliance business for 13 years, and has been associated with Mr. McGregor for eight years. The commercial and air conditioning department is under the direction of Lem M. Barlow, who has had 17 years' experience in the refrigeration industry and has been associated with the company for nine years.

From a modest start 22 years ago, McGregor's has steadily grown until today it is one of the largest distributing organizations of its kind in the South.

More than 150 members and guests of the Southeastern Electrical Manufacturers' Representatives Club were in attendance at the Club's annual dinner-dance held at Druid Hills Country Club in Atlanta. Judged by everyone as the most successful get-together sponsored by the club, the party was the concluding function of the 1941 officers. Officers selected to head the Club in 1942 include: C. W. Chapman, president; J. A. Ingman, vice-president; and R. W. Collins, secretary-treasurer. Shown in the snap shots, top row, let to right, are: W. A. Moss, Miss Evilo Rice, George Goddard, and Mrs. Moss; Dixie McKee; Miss Alma Mayer, and Carey Saylers; and Mrs. Harvey Commajere, Harvey Commajere, and J. A. Ingman. In circle are W. F. Watkins and C. C. Schoen, both former presidents of the Club. Left to right in lower pictures are: L. R. Bush, Mr. and Mrs. Ingman, and Mrs. Bush; Mr. and Mrs. W. H. Berry, Jr.; Robert Paul and L. M. Landers; Mrs. Marie Jaudon, Mrs. M. Lombardie, Mr. and Mrs. Eugene Lombardie, Mrs. L. M. Landers, Miss Eva Thurman, Dick Dustin, Mrs. Gus Henderson, and Gus Henderson.

THE YEAR'S *Best Seller* OF YOUR SERVICE AND MERCHANDISE

Here's the book of the year. It's written to appeal to women. Every lively, timely page is packed full of urgently needed advice emphasizing three major points:

FIRST—How to use each and every appliance most effectively and economically.

SECOND—How to take care of appliances so they'll last longer.

THIRD—The things to look for when buying new appliances.

In addition, this new booklet endorses the Westinghouse dealer as a source of dependable service—as headquarters for the finest electric home appliances.

Backing up this timely project is a striking series of magazine advertisements (like the one at the right) which spotlights the book and urges readers to get a copy from their Westinghouse dealer.

All the "Action Ammunition" you need to take advantage of this promotion is ready: newspaper ads, window banners and display cards. Everything is tied up in a plan that's tuned to the times. Ask your distributor about it.

Westinghouse national advertising is appearing regularly in leading national magazines. Every advertisement features Thrifty Electrical Living and urges readers to go to the Westinghouse Dealer for service, for new appliances, and for a free copy of the book.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
MERCHANDISING DIVISION • MANSFIELD, OHIO

Westinghouse ELECTRIC HOME APPLIANCES

PERSONAL NOTES
About Men You Know

George Ade Davis has succeeded **James F. Owens** as president of the Oklahoma Gas and Electric Company, according to announcement by the directors. Mr. Owens has been advanced to the presidency of the board of directors, a new post. The directors, in making the change, said Owens' new position would enable him to devote more of his time to national affairs as well as be available for consultation concerning the company's affairs.

George A. Davis

Mr. Owens has served as president of the O. G. & E. since 1931. He was once a newspaper reporter, leaving that profession in 1905 to enter the utility business as manager of the Baldwin Gas Company, at Baldwin, Kansas.

He was manager of the Wagoner Gas Company, at Wagoner, from 1906 to 1908 when he became general superintendent of the Caney River Gas Company. In 1910 he joined the Byllesby Engineering and Management Corporation as superintendent of the gas department of the Muskogee Gas and Electric Company and in 1915 became superintendent of gas construction for the Oklahoma properties of the company. He became manager in 1917.

In 1918 he was elected vice-president and general manager of the O. G. & E., and moved from Muskogee to Oklahoma City. He held the post until elevated to the presidency in 1931.

He was made president of the National Electric Light Association in 1932. He is widely known for his civic activities, in Muskogee, Oklahoma City, and over the state and nation. He served three terms as president of the Oklahoma City chamber of commerce and is a member of the board of directors of the United States chamber of commerce, holding the office of vice-president for the southwestern division.

Mr. Davis, a nephew of the humorist, George Ade, for whom he was named, is a native of Indiana and a graduate of Purdue. He has been with the company 21 years, having held the positions of assistant to the general manager, vice-president in charge of public relations, and executive vice-president.

Like Mr. Owens, he has been exceedingly generous of his time and abilities in civic projects. He was president of the Missouri Valley Electric Association both in 1939 and 1940, and has held various high offices in the American Legion.

* * *

G. H. Smith has been appointed general sales manager of the Hotpoint Company (Edison G. E. Appliance Company, Inc.) of Chicago, according to an announcement by **R. W. Turnbull,** executive vice-president. Mr. Smith has been Hotpoint general merchandising manager for the past two years. As general sales manager, he will direct all Hotpoint sales and merchandising activities, covering the Hotpoint lines of electric ranges, refrigerators, water heaters, home laundry equipment, kitchen sanitation equipment, and Hotpoint steel kitchen cabinets, as well as the Hotpoint-Edison line of commercial electric cooking equipment.

G. H. Smith

During 16 years' rapid progress in the electric appliance business, Mr. Smith has become well known to appliance dealers, distributors, and utility people all over the country for his dynamic sales presentations and merchandising ideas. He joined the Hotpoint organization in 1936 as manager of the Hotpoint Home Laundry Sales Division. In 1937, he became manager of the Hotpoint Refrigerator Sales Division, and was made general merchandising manager of all five Hotpoint home appliance lines in the fall of 1939.

Previous to his association with Hotpoint, Mr. Smith had served the Hurley Machine Co., and various specialty appliance distributors. From 1933 until 1936, he was connected with various appliance sections of General Electric Co., and General Electric Supply Corp.

* * *

Effective January 1, **H. R. Coward** became manager of conduit sales of the Steel and Tubes Division of Republic Steel Corporation with headquarters in Cleveland, it has been announceed by **W. J. Sampson, Jr.,** general manager of sales.

Born in West Pittston, Pennsylvania, in 1904, Mr. Coward received his early schooling in the East and his college training at Antioch College, Yellow Springs, Ohio.

H. R. Coward

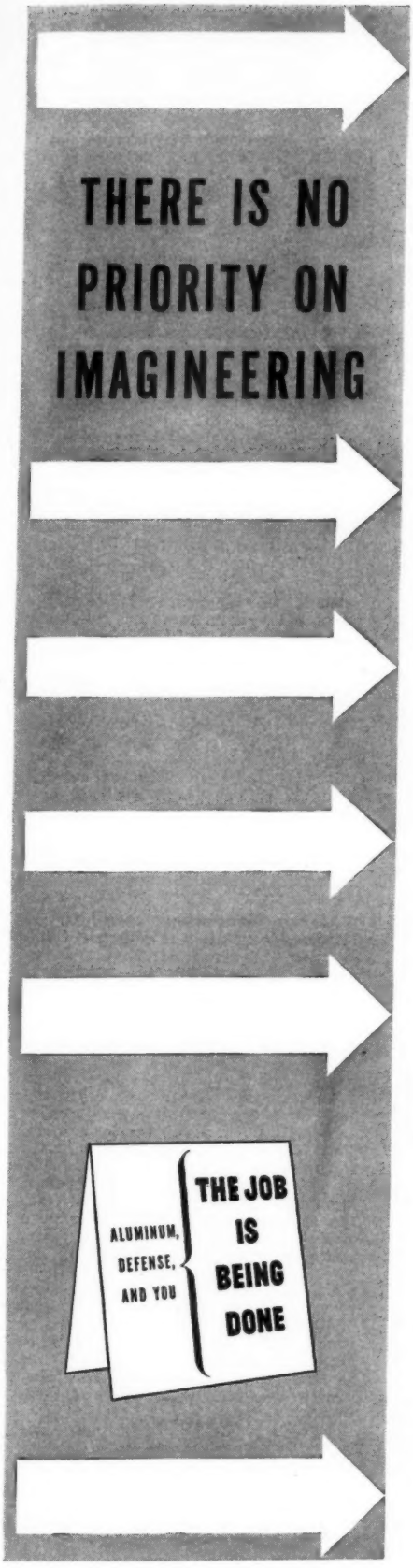
His early experience was as a sales representative of the Crouse-Hinds Company in its Detroit, Cleveland and Boston territories. Subsequently Mr. Coward represented Harvey Hubbell, Inc., in Detroit and in 1932 joined Steel and Tubes, working out of Kansas City, Missouri.

In 1937 he was moved to the Chicago office of Steel and Tubes as assistant Midwest sales manager in charge of the company's conduit sales. In assuming his new duties in Cleveland as manager of Conduit Sales, Mr. Coward succeeds **H. H. Benfield,** who has joined the Bull Dog Electric Products Company, in New York.

* * *

Major Boyd W. Bullock, advertising manager of General Electric Company's appliance and merchandise department, Bridgeport, Conn., will go into active army service February 15. He will report on that date at the Infantry School, Ft. Benning, Ga., where he will attend the Battalion Staff Officers Refresher Course.

Glenn Gundell who has been assistant to the advertising manager, now becomes assistant advertising manager, and will be in charge during Major Bullock's absence. Mr. Gundell directed the advertising and sales promotion activities of the General Electric air conditioning and commercial refrigeration department at Bloomfield, N. J., for five years. Prior to that, he had been engaged in advertising with New York agencies and with midwest newspapers.



EVERY INDUSTRY, every responsible man in industry, has the present duty of answering two questions.

FIRST ONE IS: Are we, am I personally, doing everything within my power for the war? Our answer here at Alcoa is a plain, unqualified, yes.

NEXT QUESTION IS: What are we doing about the day when we will all need business, which is the polite way of saying, when millions of jobs will be needed for the boys who come back, and for the boys who stayed back to make the weapons.

IMAGINEERING, you know, is the word we have coined to define what we business people have all got to do about the future; about the products we are going to make and the services we are going to be able to offer when this war is over. Imagineering is imagination plus engineering.

HOW DO YOU DO IT? One way would be to figure out, now, how to take advantage of all the aluminum that is going to be available.

QUICKEST WAY TO GET AT IT is to take one of your products or a piece of equipment that "just couldn't" be made of aluminum, and ask yourself, Why not?

MEANING, OF COURSE, why not light; why not stronger for the same weight; why not resistant to corrosion, and so on, ad infinitum. The first man in any line of business who calls tradition a liar, and things-as-they-are a millstone, is the man who is going places; the man who is going to make peacetime pay rolls.

THAT'S IMAGINEERING AT WORK. We've got some ideas here at Alcoa. We're trying to pass them out. We are looking for men who have made themselves receptive by doing some solid Imagineering on their own hook, in their own fields.

Aluminum Company of America, 2164 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

Expanding its sales force in the rapidly growing industrial South, The Okonite Company has added four sales engineers to this territory. The new men are **Otis W. Herring, Wm. D. Stroud, L. L'Heureux** and **W. H. Hammond.**

Mr. Herring, who will be located at The Okonite Company's office in the Comer Building, Birmingham, Alabama, will handle Tennessee and the northern portion of Alabama and Mississippi. He has had a background of 15 years' experience in sales and construction work with Western Union, Truscon Steel and several other industrial organizations.

Mr. Stroud, formerly a distribution engineer with the Georgia Power Co., will cover Louisiana and the Gulf Coast area of Florida, Alabama and Mississippi and will take over the work previously handled by Rhea Lapsley who resigned from The Okonite Company to serve with the U. S. Army Engineers in which he held a reserve commission. Mr. Stroud will be located at 621 Julia Street, New Orleans.

Mr. L'Heureux, who will handle the Florida territory from his home at 2360 St. Johns Ave., Jacksonville, was formerly district superintendent of the Alabama Power Company in Jasper, Alabama, and has had 16 years' experience in the electric utility field. He is a graduate of the Georgia School of Technology.

Mr. Hammond, a graduate electrical engineer of North Carolina State College and formerly with Crocker-Wheeler Electric Manufacturing Co., and the Copper Wire Engineering Association, has had 12 years' experience as a sales and consulting engineer in the electrical field. He will be located at 2538 Kenmore Ave., Charlotte, North Carolina.

* * *

After 40 years of service with G.-E., **J. C. Dallam,** manager of the wiring device section of General Electric's appliance and merchandise department has retired. He is succeeded by **T. D. Foster,** who, in addition to his new duties as manager of

T. D. Foster

the wiring device section, will retain his present position as manager of the accessory equipment section. The appointment was announced by J. H. Crawford, manager of the construction material division.

Mr. Foster joined the G-E wiring device section in 1924 and was made manager of the accessory equipment section upon its formation in 1928. He had been superintendent of the American Chicle Company's refining plant in Long Island City, N. Y.

* * *

Homer Prater, Atlanta, Ga., Knapp-Monarch representative covering Alabama, Florida, Georgia, Mississippi, and Tennessee, has been awarded the K-M diamond pin as "1941 King of Producers." Andy Knapp, K-M president, made the award. The occasion was Knapp-Monarch's winter sales meeting and banquet, held at the Chase Hotel, St. Louis, in December, at which time President Knapp and other K-M officials presented the firm's promotional and advertising plans for 1942 and introduced the new year's line of K-M "electrical servants."

* * *

L. P. Spoon has just become associated with Walker Electrical Company, of Atlanta, Ga., as sales engineer, according to announcement by **T. J. Fleischer,** vice-president in charge of sales. Mr. Spoon was formerly with Crouse-Hinds Company, Philadelphia, and Harrison-Wright, of Charlotte, N. C.

* * *

L. Morris Landers, manufacturers' representative, of Atlanta, Ga., has been appointed sales representative for John C. Dolph Co., of Newark, N. J. Mr. Landers, who makes his headquarters at 308 Walton Building, Atlanta, will represent Dolph in the states of Georgia, Alabama, South Carolina and Florida. A complete stock of standard Dolph products will be maintained in Atlanta in order to expedite deliveries. The facilities of the Dolph electrical and chemical laboratories are available to the industry through Mr. Landers without obligation, and inquiries directed to him relative to the varnish insulation of electrical equipment will receive his prompt and capable assistance.

* * *

Two major sales executive changes have been announced by **E. G. Biechler,** general manager, Frigidaire Division, General Motors Corporation.

C. A. Copp, vice-president of General Motors Sales Corporation will devote his entire time to directing Frigidaire's extensive defense activities and **P. M. Bratten,** head of Frigidaire's Appliance Division, has been

C. A. Copp

P. M. Bratten

appointed general sales manager of the combined Appliance, Commercial and Air Conditioning Divisions, assuming Mr. Copp's former responsibilities. **H. F. Lehman** continues as sales manager of the Commercial and Air Conditioning Division.

* * *

W. R. Wolfe, former Eastern Division sales manager for Oklahoma Gas and Electric Co., has been named Eastern Division manager, effective February 1, succeeding **R. C. Coffy,** who will retire, terminating a service that began in 1908.

Mr. Wolfe became associated with the O. G. & E. Co. directly after graduation from the University of Oklahoma in 1926. After serving for a period in the engineering department, he was transferred to Muskogee as assistant commercial agent. In 1939 he was made sales manager at Muskogee.

* * *

Albert Lieberman, president of Southwestern Gas and Electric Company, died Friday afternoon, January 16, at Texarkana Hospital, Texarkana, Texas, following an illness of a few hours. Surviving are his widow, two daughters, and three sisters.

Mr. Lieberman was born September 30, 1886, in LaFayette County, Missouri. His career in the electric industry in the Southwest began in Mammoth Springs, Arkansas, where he served as an executive for a small hydro-electric company. He later went to Walnut Ridge, Arkansas, where he became associated with the Morrison-McCall interests of St. Louis, and for ten years had charge of their properties in Arkansas, Oklahoma, and Missouri. During his association with Morrison & McCall, he acquired many utility properties, some of which are at this time owned and operated by Southwestern Gas and Electric Company. He then went to McAlester, Oklahoma, for a short time as vice-president and general manager of the McAlester Gas and Coke Company.

Early in 1926 Mr. Lieberman came to Southwestern Gas and Electric Company as assistant to the president. In 1928 he was elected vice-president and general manager, and in March, 1929, was elected president in which capacity he has served until his untimely death.

+ + + + + + + + + + + + + + +

Why your Red Cross urgently needs

FIFTY MILLION DOLLARS, NOW

How the fund is allocated . . . What it does in service

Every dollar that you give now to your Red Cross marches into the thick of things where humanitarian help is needed most—up to the fronts and battle stations where the fighting is heaviest. Into the Red Cross hospitals and First Aid units where prompt medical attention and supplies may save innumerable lives. And throughout our broad land to train and equip volunteers to meet any emergency that may strike.

How the $50,000,000 War Fund is Used

SERVICE TO THE ARMED FORCES $25,000,000

Provides for the care, welfare and morale of the Army and Navy, including services to men in hospitals and during convalescence. ● Provides an important link between the service men and their families; keeps the families from breaking up, supplies food, shelter, medicine, and even jobs where necessary. ● Provides essential medical and other supplies outside of standard Government equipment. ● Operates Red Cross headquarters at camps and naval stations. ● Enrolls blood donors and medical technologists for Army and Navy needs. ● Provides millions of surgical dressings, sweaters, socks, etc. through volunteer workers.

DISASTER AND CIVILIAN EMERGENCY RELIEF . . $10,000,000

Supplies emergency needs for food, clothing, shelter and medical attention for disaster victims. ● Assists stricken families in repair of homes and other adjustments; provides minimum reserves of essential relief supplies to prevent unnecessary delays.

CIVILIAN DEFENSE SERVICES . . . . . $ 5,000,000

Trains volunteers for home nursing and nurses' aides. ● Trains nurses, men and women, for active duty with the Army and Navy. ● Trains volunteers in First Aid and Accident prevention. ● Trains volunteers for work in Motor Corps, Canteen and Production. ● Instructs men, women and children in preparedness against explosive and incendiary bombs. ● Organizes for evacuation of children and their families from stricken areas. ● Assists Red Cross Chapters in establishing effective coordination of emergency relief with local and State defense authorities.

SERVICE AND ASSISTANCE THROUGH CHAPTERS $ 4,000,000

Gives assistance and service to the 3,740 Red Cross Chapters with their 6,131 Branches responsible for local Red Cross activities, particularly welfare work among the service men and their families.

OTHER ACTIVITIES AND CONTINGENCIES . . . $ 6,000,000

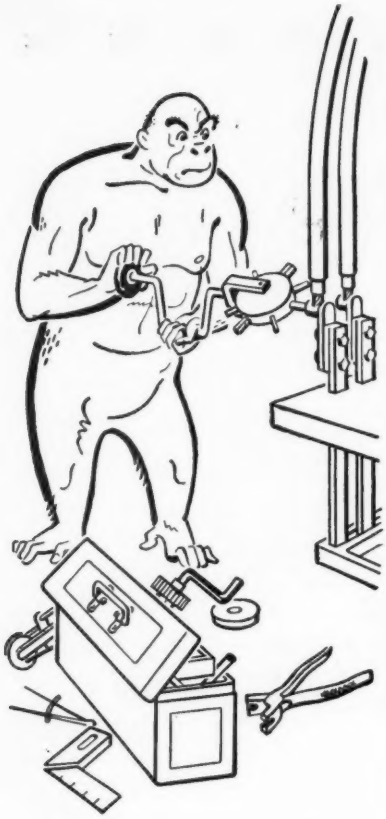
Provides for unforeseen expansions in program and for new activities made necessary by unexpected developments.

TOTAL $50,000,000

THE AMERICAN RED CROSS $50,000,000 WAR FUND

Note to Red Cross Canvassers: Use this material to better inform contributors how their donations are being expended.

(This space has been donated free by this publication)



Special Tools and Gadgets aren't necessary if you use National Electric "Gorilla Grip" Connectors.

Pliers or standard wrenches are all that are necessary to make a tight, positive connection when "Gorilla Grips" are used. And to make them even more convenient and easier to handle, National Electric has assembled stock sets to meet your particular needs and to suit your plant requirements. Write and ask for particulars.

National Electric
PRODUCTS CORPORATION
300 FULTON BUILDING, PITTSBURGH, PA.

NEW EQUIPMENT and MATERIALS

Low-Price Kitchen Package

Designed for, and available only for, low-cost housing projects where limited space, moderate price, and portability are considerations is a new electric roaster-hotplate-cabinet combination that is being supplied by the appliance and merchandise department of the General Electric Company, Bridgeport, Conn.

This "package," which will do the basic cooking job for a small family electrically and economically, is not available to individual customers as

a unit through regular channels of distribution, but may be obtained in quantity orders through G-E distributors at a special price of approximately $35 per unit, depending on exact specifications and related factors.

All types of meals may be prepared with the two cooking appliances. The standard G-E roaster has a capacity of 18 quarts, a 1320-watt heating element, and is thermostatically controlled to maintain an oven temperature of from 150 to 550 degrees. The roaster lid is of black porcelain enameled-steel. Utensil equipment consists of two covered vegetable dishes and an open low-side roasting dish, all of heat-resistant glass. The roaster broiler-griddle attachment can be used for broiling steaks, chops, and fish, and for preparing griddle foods and frying.

The hotplate has two open-coil surface units and a total rated capacity of 1650 watts.

Service Promoting Display

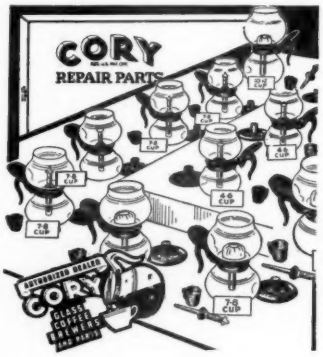
A striking display card has been produced by Premier for the use of appliance dealers to promote reconditioning of their customers' old vacuum cleaners. This card may be used

independently or in conjunction with a display of "old timers" . . . old Premier cleaners that have been modernized and completely reconditioned and "guaranteed to work like new and look like new." Full information regarding this and other sales helpers may be obtained by writing the manufacturer.

New Cory Assortment

Three purposes of the new Cory "Authorized Dealer" assortment are: (1) To increase immediate business (2) Bring new customers into your store (3) Build good will for the future. In addition to a carefully selected assortment of ten Cory Brewers, there are eight pieces of replacement glass, 12 Cory Glass Filter Rods and an Authorized Cory Dealer Repair kit. It adds up to an extra value at retail of $10.30.

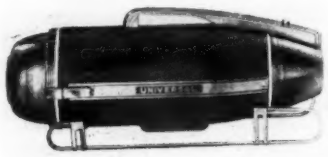
The repair kit includes a hand-picked assortment of replacement parts—adequate to service any Cory Brewer. There are 19 different items, some duplicate, 33 separate pieces in all, in a handy box. Along with this special assortment, the dealer gets an attractive "Authorized Dealer" window-pane "Decal" in black, red and



gold. Jobbers and dealers wishing full information should address Cory Glass Coffee Brewer Co., 325 North Wells St., Chicago, Ill.

Tank Type Cleaners

Universal three dimensional tank type cleaners for 1942 will feature time and health saving devices for speedy cleaning in defense. An extraordinary feature of these cleaners is the Germ Trap situated at the base of the dust bag which filters the fine particles of dust that seep through the bag, purifying the air as it is sucked through the hose by means of the whirlwind super suction.



Second of the three unique features of Universal's tank type cleaner is the clever little "Tattle Tale" light that flashes on when the bag needs emptying and stays on until it is thoroughly cleaned.

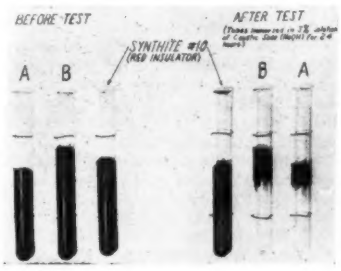
The third feature is the thread picking nozzle which does not drag nor seal on rugs. This extraordinary feat is accomplished by the projections on the nozzle, and by means of the super intake whirlwind suction which is a little tornado in itself.

Red Insulating Enamel

Tests conducted by John C. Dolph Co. Laboratories on their Synthite No. 10 Red Insulator indicate unusual caustic resistance properties. Glass test tubes prepared with one dipped coat of each enamel under test were baked at recommended temperatures and hour cycles. The treated tubes were immersed for about half their length in a 3% caustic solution with the results shown in the accompanying photograph.

Test tube A, treated with an enamel for which caustic resistance is not claimed, had its enamel lifted from the glass, while the examination of tube treated with Synthite No. 10 indicated that the film had adhered tightly to the glass and possessed the same degree of gloss as before the caustic test. The film showed no signs of deterioration or breaking down from the caustic action.

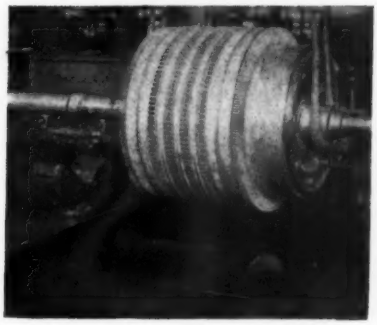
Along with this remarkable resistance to caustic attack, Dolph's Sny-



G-E Varnished Tubing used on power leads in radio chassis for extra protection.

G-E Twine being applied to front end of commutator to provide extra protection.

G-E Varnished Tubing applied to coil leads affords extra protection.



Large armature about to be dipped into G-E Insulating Varnish for extra protection.

PREPARE

WITH *Extra Protection* ... USE

G-E INSULATING MATERIALS

Victory demands preparedness. Insist that your equipment is prepared with the *extra protection* of G-E Insulating Materials.

The complete line of high-quality General Electric Insulating Materials is fully described in the G-E Insulating Materials Catalog. For a copy, please see your nearest G-E Merchandise Distributor, or write to Section M-2162, General Electric Co., Appliance & Merchandise Department, Bridgeport, Conn.

GENERAL ELECTRIC

thite No. 10 Red Insulator offers maximum resistance to the attack of acids and oil, and is waterproof. Furnished at brushing consistency, it may be reduced 25% with Dolph's No. 170 Thinner or toluol for spray application.

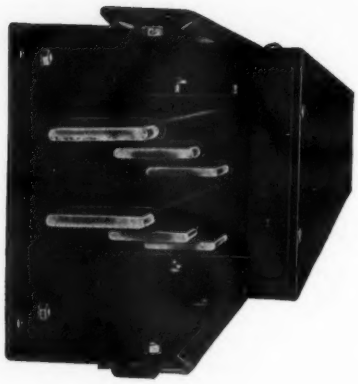
Synthite No. 10 air dries dust free in one-half hour, tack free in two hours and hard in eight hours. The caustic resistance of this material can be improved by baking treated units from one to two hours at about 200 degrees F. after air drying for four hours.

Snythite No. 10 is recommended for inside or outside use as a protective coating for rigid motor windings, commutator end bars, or for any application where the use of a tough, high gloss, bright red enamel is desired.

Snythite No. 10 Red Insulator may be obtained in one quart, one gallon, five gallon, 30 gallon and 55 gallon containers. For test purposes, Snythite No. 10 Red Insulator is available in one quart containers at a cost of $1.20 per quart.

Trumbull Buss-Wa

The Trumbull Electric Manufacturing Company, of Plainville, Conn., is distributing Circular No. 335 illustrating and describing their new type L.V.D. (Low Voltage Drop) Buss-Wa, which delivers full voltage power at the point of load. This Buss-Wa—an enclosed busbar main artery of an



electrical feeder distribution system—is so engineered and constructed that it will easily withstand the heavy short circuit stresses that may be encountered in modern electrical distribution systems.

The L.V.D. Buss-Wa goes far beyond the mere consideration of transmission of electrical current and cross sectional area of conductors into the field of high interrupting capacity.

Burndy T-Connector

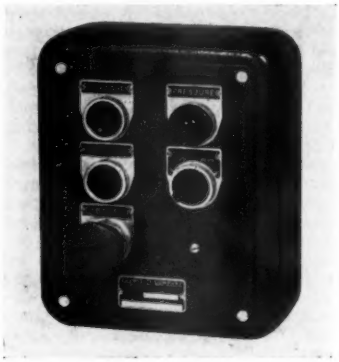
The Burndy connector, Type NVT, is an all-clamp Type T-Connector for tapping cable from tubing. A flattened U-bolt on the tap accommodates a large range of cable sizes. In addition, the large compressive range of the U-bolt makes it especially suitable for clamping flexible and extra-flexible cables.

Where mechanical stresses are considerable, two U-bolts may be desired. On large conductor sizes, four oval-shank Everdur bolts are used to

clamp the run conductor, as illustrated. For small sizes two bolts are used. The large flat clamping surface of the U-bolt insures good contact without cutting or mutiliation of cable strands.

Machine Control Stations

In answer to machine tool manufacturers' demands for greater flexibility of application, the Industrial Controller Division of the Square D Company now offers the new series of Class 9001, Type M push button stations and enclosures. Heavy cast construction of the enclosure provides ample protection against accidental damage to control units. Blue-gray enamel finish adds to the attractive appearance of these new devices.



Enclosures are available for 3, 6, 9, 12 and 16 push button, selector switch, or pilot light control units. Each may be furnished as an assembled station or as an enclosure only, in which the machine tool manufacturer can fit units from stock to fill his immediate needs. Closing plate assemblies are provided for unused openings in the cover plate.

The enclosure consists of a cast iron case, gasket and steel cover plate, drilled to accommodate standard drip-tight control units. The case may be drilled and tapped for conduit entrance in five locations.

At right — Type S-O Heavy Duty Lug. Pure copper. Rigid and sturdy with extra contact area. Sizes from 35 to 400 amps. Underwriters approved.

At left — Type S-M, low cost, one-piece design. Compact and strong. May be soldered if desired. Sizes from 50 to 400 amps.

Sherman
SOLDERLESS LUGS
Make* QUICK *Connections
***That Are* PERMANENT**

Sherman solderless type lugs can be absolutely depended on — strong, rigid, permanently tight. Assembled in a jiffy. May be used over and over again. Interchangeable with standard soldering lugs. WRITE FOR SAMPLES.

H. B. SHERMAN MANUFACTURING CO.
BATTLE CREEK, MICHIGAN

Bull Dog Condensed Catalog

Bull Dog Electric Products Co., Detroit, Mich., have just issued Catalog No. 421, dated January, 1942, listing safety switches and other Bull Dog Products. Equipment is grouped in conveniently indexed sections covering switches, service equipment, light-

ing panels, circuit breaker panels, Saftofuse panels, Kbl-duct, Vacubreak switchboards, and miscellaneous devices. A special feature of the catalog is a group of color pages at front and back describing newest Bull Dog developments.

Also available upon request is Bulletin No. 421 on the Vacu-Break safety switch which features "Clampmatic" contacts and front-operated rocker handles. See illustration.

Wagner Motors

The Wagner Electric Corporation recently published a new 34-page bulletin on single-phase, direct-current, and small polyphase motors manufactured by the company. The bulletin contains detailed descriptions of the construction of repulsion-start-induction motors, repulsion-induction motors, capacitor-start motors, split-phase motors, direct-current motors, small polyphase motors, fan motors, and explosion-proof motors.

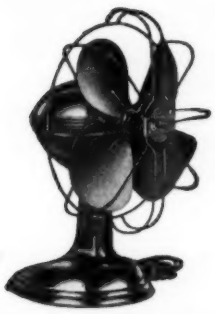
This new bulletin is now available for distribution to those interested in the above listed motors. For a copy, address Wagner Electric Corporation, St. Louis, Mo., and ask for "Bulletin MU-183."

Methods of Protecting Commutator Vee-Rings

(*Continued from page 33*)

thermo-setting varnish. Then soak one or more rolls of .007" thick x 1" or 1¼" wide close weave glass tape (ECB grade) in a clear thermo-setting varnish.

Apply four layers of this treated glass tape, use tape wet, and half overlap each layer, brush on thermo-setting varnish between layers, sew ends of tape, and bake varnish dry. Then apply three coats of No.



WHERE DO YOU STAND ON R & M FANS?

As you know, everybody expects a record demand for quality fans this summer. And it's no news to you that the industry probably *won't* be able to make enough to go around.

We believe, however, that we will be able to produce a *substantial* number of R & M fans for the 1942 season. Just *how many* there'll be, we don't know. We might not be able to fill every distributor's order *completely*—especially those that come in late.

For this reason, we urge you to put yourself in the best possible position with your distributor by giving him your order *immediately*—for shipment as soon as possible—so he'll know where *he* stands. Then when his order is filled by us—in whole or in part—we are sure he'll return the favor by seeing that you get your share.

You have our word that the fans we *will* make will be as *fine as ever* in construction, performance, efficiency and durability. And considering higher production costs and higher taxes, they'll be better values than we've ever been able to offer in the past.

Get in touch with your R & M fan distributor *now*. If you don't know the name of the distributor nearest you, write us at the factory or ask the nearest R & M Branch Office listed below.

Retail prices—including Federal Excise Tax—of 1942 desk models (60 cycles, A. C.) are listed here for your convenience:

BANNER FANS	STANDARD FANS	DELUXE FANS
8-inch, $4.95	10-inch, $15.95	10-inch, $19.95
10-inch, $12.95	12-inch, $32.00	12-inch, $35.95
12-inch, $19.95	16-inch, $38.95	16-inch, $41.95

Doing Our Best for America!

☆ R & M fans are serving in Army Camps, on shipboard, and in Army and Navy Hospitals. R & M Motors, Hoists, Cranes and Moyno Pumps are speeding production in countless armament industries. ☆ ☆

ROBBINS & MYERS • INC.

SPRINGFIELD, OHIO • Branch Offices in:

NEW YORK, 200 Varick St. CHICAGO, 2400 W. Madison St. PHILADELPHIA, 401 N. Broad St.
KANSAS CITY, 2105 Grand Ave. NEW ORLEANS, 500 Camp St. DALLAS, 1100 Cadiz St.
SAN FRANCISCO, 237 Rialto Building
THE ROBBINS & MYERS CO. OF CANADA, LTD., Brantford, Ont.

672 red oxide cement, sandpaper the second coat.

When ordering the glass tape be sure to specify the .007" thick and ECB grade as this is the thickest tape supplied in the B or tight weave needed for smooth glossy finish.

Shifting Appliance Repairs to Dealers

(*Continued from page 25*)

It's all up to us now. He is entitled to every opportunity we can give him. He should have a free and open market to work in. He should be able to hang out his shingle wherever he pleases. He should receive our blessings in the form of newspaper, radio and direct mail advertising announcing his change of address and the valuable, efficient service he can render the public. And last but not least, he has a perfect right to expect the manufacturers to provide him with a post graduate course in servicing and a plentiful supply of appliance parts to satisfy his needs and the customers' needs.

Better Management For Your Business

(*Continued from page 19*)

where another method is used, all depreciation accounts should be checked once yearly to determine how closely appraisal value lines up with book values.

We have found that straight-line depreciation is most satisfactory, simple, and safe. Moreover, the Treasury Department recommends it for income tax purposes and 90 per cent of the business organizations in this country, from the corner grocery to the large utility company, use straight-line depreciation. Electrical contractors who use this method should find it a satisfactory solution of the depreciation problem.

Utility Finances Rewiring Work

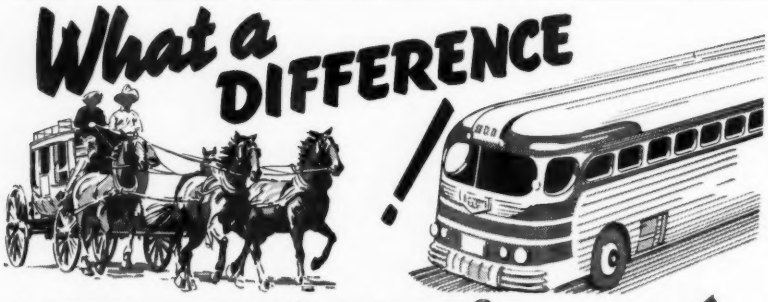
(*Continued from page 17*)

of the agreement, along with an invoice for the unpaid balance, to the company. The company issues a check to the contractor and bills the customer by adding the regular payments to his monthly electric service bill.

Proposed Publicity of Plan

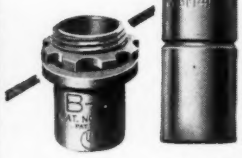
When the plan was originally started, it was proposed to publicize it rather widely through the use of radio, newspapers and other advertising aids. Tags calling attention to and emphasizing the necessity of adequate wiring for convenient and satisfactory operation of appliances, also announcing the time payment plan, were to be attached to lamps and other small appliances sold. However, on account of the emergency and restrictions on critical materials, all publicity plans have been withheld.

There has been very little usage made of the plan. This is probably because of the inopportune time of putting the plan into operation and also the lack of publicity. Therefore, its effectiveness cannot be determined at this time. It is believed, however, that with proper amount of publicity and normal times such a plan will be of material assistance to electrical contractors wishing to sell and install additional wiring in existing homes.



And there's just as much difference between the *streamlined* BRIEGEL METHOD of making connections and former old-fashioned methods.

The BRIEGEL METHOD saves you up to 50% on time and a substantial saving on materials allowing you a larger margin of profit on each job. Make quick, easy, strong and neat connections this MODERN way.



No extra turns or twists, no nuts to tighten when you use B-M connectors and couplings. Just TWO SQUEEZES with the patented B-M indenter (which costs you only $1.25) and you have a smooth efficient job. Approved by Underwriters Laboratories.

DISTRIBUTED BY

The M. B. Austin Co.
Chicago, Ill.
Clayton Mark & Co.
Evanston, Ill.
Clifton Conduit Co.
Jersey City, N. J.
General Electric Co.
Bridgeport, Conn.
The Steelduct Co.
Youngstown, Ohio
Enameled Metals
Pittsburgh, Pa.
National Enameling & Mfg. Co.
Pittsburgh, Pa.
Triangle Conduit & Cable Co.
Elmhurst, N. Y. C.

BRIEGEL METHOD TOOL CO., Galva, Ill.

Modern Industrial Wiring Practice

(*Continued from page 16*)

cable so that the net additional cost will be between 8% and 10% for the two 3-inch lines.

The entire discussion relative to Table 1 applies to any type of raceway or cable job, metallic or non-metallic, i.e., conduit, BX, non-metallic sheathed cable, etc. If open wiring on insulators or concealed knob and tube work is to be used, the current capacity of the wire may be increased.

In these two last mentioned types of installations, the direct exposure to air provides better radiation of the heat generated in the conductors. It will, therefore, permit a larger current to be carried by the wire before bringing the insulation temperature up to its maximum value.

Table 2, on page 302, of the Code (not reproduced here) shows these new current values for all seven classes of conductors previously described as well as for an eighth class consisting of slow burning, Type SB, slow burning weatherproof, Type SBW, and weatherproof, Type W.

USE DEPENDABLE
MACALLEN *Mica*
FOR EVERY
ELECTRICAL NEED!

MICA PLATE
Moulding, Segment, Flexible, and Heater
MICA AND FIBERGLAS COMBINED
MICA PAPER
MICA CLOTH
MICA COMMUTATOR RINGS
MICA COMMUTATOR SEGMENTS
MICA AND RED ROPE PAPER
MICA AND FISH PAPER
MICA AND PAPER TAPE
MICA TUBING

Write for the
IWI BLUE CATALOG!

All MACALLEN MICA Products Distributed by:
INSULATION and WIRES, Incorporated
2127 Pine Street, St. Louis, Missouri
289 Simpson Street, N. W. Atlanta, Georgia

Mr. Priority Holder . . .

YOU CAN GET Paragon TIME CONTROLS Now!

Write for This Book . . .

It fully illustrates and describes the numerous models of time switches, timers, and time delay relays which Paragon can supply now to priority holders. Paragon instruments are being used widely in war equipment. The same qualities of up-to-the-minute design, ruggedness, precision, reliability and minimum service requirements which give them preference in civilian applications fit them for the strenuous demands of battle.

Write today for your complimentary copy of the Paragon catalog.

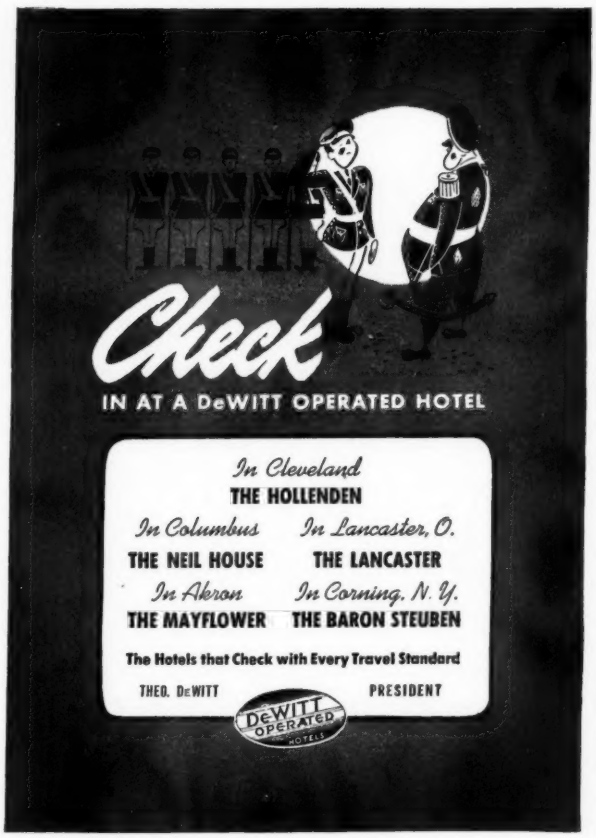
Southern Representatives

WILLIAM E. HOPPER
357 Marietta Street, N. W.
Atlanta, Georgia

GEORGE E. ANDERSON CO.
Santa Fe Building
Dallas, Texas

Large Stocks for Immediate Shipment in Atlanta and Dallas

Paragon *Chicago*
BUILDERS OF CONTROL INSTRUMENTS SINCE 1905



IN THE YEARS AHEAD

QUALITY WILL STILL BE OUR PRINCIPAL PRODUCT

Since 1892 Signal Products have established themselves as the ultimate in Quality and Price. In the years to come Quality will still be the principal product of the Signal plant—each year aiming to make the best product for the price.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan

Branch Offices:
W. E. Hopper
357-59 Marietta St., Atlanta, Ga.
Geo. E. Anderson
Santa Fe Bldg., Dallas, Texas

SIGNAL

GREENLEE BENDERS

FOR ANY OF YOUR BENDING JOBS

Here are just three of the complete line of Greenlee Benders for any size conduit, pipe, or tubing from ¼ to 4½ inches. Small hand benders will handle all tubing up to ¾-inch, while powerful hydraulic benders will take care of conduit and pipe up to 4½ inches. Write for S-116 Bender Booklet describing complete line of benders and attachments.

Greenlee TOOL CO.

1762 Columbia Avenue - Rockford, Illinois

The other characteristics of these conductor insulations are shown in the Table on page 287 of the 1940 Code. Temperature correction factors are applicable to this Table 2, also, and, as in the case of Table 1, are shown at the bottom of the Table.

Load-Center Distribution For Industrial Plants

(Continued from page 12)

of which will be accounted for by imperfect cable tap connections, or termination.

The service interruption of more or less indeterminate duration following a primary circuit outage is, of course, objectionable but may, in many instances, be tolerated.

The fact that both primary circuits are usually brought into close proximity at every unit substations represents a distinct hazard to service continuity.

The presence of the transfer means which must be manipulated on a number of load centers for every transfer from normal to emergency operation and again in restoring normal conditions, makes this circuit arrangement slightly more complicated to operate than the simple radial circuit arrangement.

Type 3 — Secondary Selective (Fig. 7.)—The secondary selective circuit arrangement differs from those previously described in that the load center incorporates complementary branches, each permanently associated with a particular high tension feeder. Transfer from normal to emergency operation is accomplished by means of a low tension tie breaker between the two complementary sections. This extends the duplication of supply to the load center low tension bus and thus provides for continued service with either a transformer or a primary feeder out of service.

Under normal conditions the tie breaker is open and both transformer breakers are closed, in which state the system exhibits all the elements of simplicity to be found in the simple radial system.

For emergency operation, the transformer low tension breaker associated with the channel which has been or is to be deenergized is opened and the low tension tie breaker closed. Loading levels have been selected such that a transformer is subjected to not more than 125% rating during emergency operation.

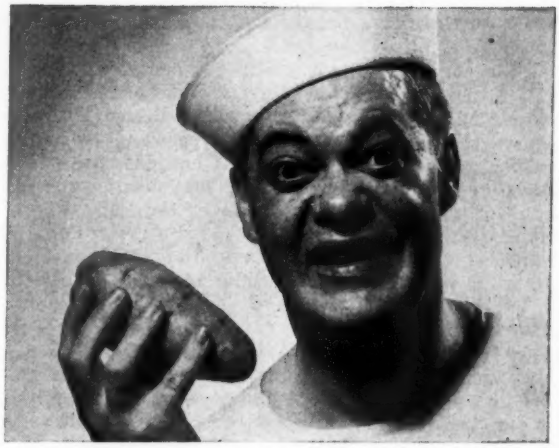
The installed cost is increased over that of the primary selective arrangement largely because of reduced normal loading level on transformers. The relative cost level is between 145% and 150% of the cost of the simple radial circuit. However, the reduced normal transformer loading provides additional benefits aside from service reliability in the form of lower losses, lower transformer temperature and consequent increased life, and better voltage regulation. The cost per kva can be reduced by normally operating the transformers at a load more nearly equal to rating, depending on load curtailment to avoid excessive transformer load during emergency operation.

The same order of safety as associated with the simple radial circuits is retained. All transfer switching from normal to emergency conditions and vice versa is performed on full interrupting capacity low tension air circuit breakers. The possibility of producing a complete primary system shut-down by transferring a fault to the healthy feeder is eliminated. The individual transformer primary disconnect switch is used only for isolating purposes and represents only a slight hazard.

In respect to service reliability, this circuit arrangement excels the primary-selective circuit. Continued operation is insured with a transformer as well as a primary cable out of service. For very little increased cost, provision can be made for automatic transfer to emergency operation through electrical operation of the tie breaker, by which means restoration of voltage may be accomplished within an interval of about one to two seconds. The normal operation of transformers at considerably less than rating allows an unusual temporary load demand in any area to be met without distress.

Simplicity of operation comparable with that of the simple radial circuits is obtained. The low tension tie breaker between complementary bus sections represents the only feature which modifies the operating procedure.

Voltage regulation is reduced under normal operating conditions as a result of reduced transformer loading. Voltage regulation under emergency operating conditions is only slightly inferior to that of the



CONTROLS ON "MESS DUTY"

Many of the potato peeling machines used by both Army and Navy are equipped with Ward Leonard Motor Starters. Our long experience in designing and building electric controls, through the intensive electrification period of industry, admirably fits us for the present emergency. We know how to meet special control requirements and how to produce in quantity to government standards.

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) *devices since 1892.*

WARD LEONARD ELECTRIC COMPANY, 37 SOUTH ST., MT. VERNON, N. Y.

THE SALES PRICE

of an article is often from two to ten times its cost to manufacture.

That one fact indicates the opportunities to increase sales and profits through better distribution and merchandising.

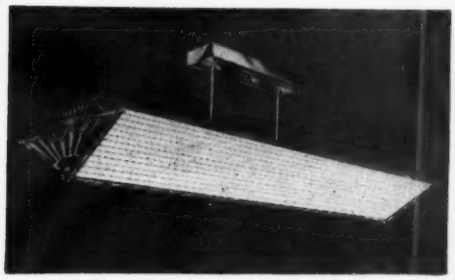
ELECTRICAL SOUTH, through its editorial pages, points the way along constructive lines and presents information, ideas, and plans based on the intimate contact of its editorial staff with the electrical utilities, dealers, and contractors of the South. Coming issues will contain many important merchandising articles relating to sales training, demonstrations, canvassing, appliance servicing, and displays; engineering features describing modern trends in transmission, distribution, and utilization; and many items of special interest to electrical contractors on both practical and technical subjects.

Take advantage of these valuable articles by reading your copy of ELECTRICAL SOUTH carefully each month. If you are not already a subscriber, it costs only $1.00 for one year or $2.00 for three years.

ELECTRICAL SOUTH
GRANT BUILDING ATLANTA, GA.

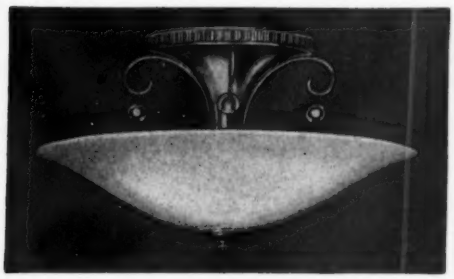
For Smart Fixtures that are the Ultimate in Efficiency See the latest **GLOBE** *Lines*

***For Commercial and Industrial Use . . .**



NEW GLOBE FLUROLUME models . . . High in Quality and Efficiency . . . Moderate in Price.

***New TEE Line Models for Residential Use . . .**



These new fixtures represent the last word in incandescent lighting for the home.

Send for these three New Catalogs:

1. Residential Fluorescent. 2. Residential Incandescent 3. Commercial Fluorescent . . . No Obligation

Representatives for GLOBE in the South:
Mr. Henri Duizend, 2811 Dublin, New Orleans, La.
Anderson-Shattuck, 3117 University Blvd., Dallas, Tex.
Mr. S. M. Wittenberg, 531 Santee Ave., Columbia, S. C.

When in New York - Visit the New Globe Showrooms*

* WHOLESALE ONLY

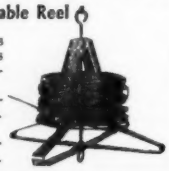
At 16 East 40th Street,
(Just East of Fifth Avenue)

GLOBE
LIGHTING FIXTURE MFG. CO
Factory Brooklyn, N. Y.

Beat Contract Dates
with IDEAL Wiring Devices

NEW! Wire and Cable Reel

Trouble-Saver — Prevents those exasperating snarls and knots. Prevents damage to wire.
Adaptable—Handles insulated wire No. 18. to No. 2. cord, cable, Romex, etc.
Convenient — Hangs anywhere, singly or in tandem.



IDEAL Wire-Nuts

Solderless, Tapeless, Wire Connectors
STRIP WIRES—SCREW ON—THAT'S ALL
Safer—no hot soldering or blow torch.
Better Electrically—stronger mechanically.
Thread on to wires just like a nut on a bolt.
Sizes for all common wire joints.
Fully approved—listed by Underwriters' Laboratories, Inc.

MILLIONS IN USE—Send for FREE Samples.
Other IDEAL Job-Speeders

IDEAL SOLD THROUGH JOBBERS
IDEAL COMMUTATOR DRESSER COMPANY
1017 Park Avenue Sycamore, Illinois
"SALES OFFICES IN ALL PRINCIPAL CITIES"

VITAL
-keeping your lines
GOING!

TRANSMISSION line breaks or crippling "shorts" *can* cost you more than a whole year's scientific tree-trimming!

Expert tree-trimming costs little—saves much. It keeps trees blameless in power failures. It removes *one* risk of sabotage from national defense—and an important one, mind you. Better look into this—now.

NATIONAL DEFENSE DEMANDS
uninterrupted Power
ASPLUNDH
TREE EXPERT COMPANY
HOME OFFICE
JENKINTOWN, PA.
OGONTZ 3750

simple radial circuits as a result of transformer operation of 125% rating.

Type 4 — Secondary Network (Fig. 8.)—The secondary network system is distinguished from others in that continuously connected duplicate sources are provided to each low tension load center bus. The prime source is represented by a transformer tie to the primary system while low tension tie circuits interconnected with one or more other prime sources constitute the emergency source. Two or more primary feeders are used and the emergency source for one load center is derived from prime sources associated with a different primary feeder.

Provision is made for automatically clearing any particular prime source or tie circuit which becomes involved in fault without interrupting other source connections. This requires a network protector in the secondary of each transformer. A network protector is an automatic circuit breaker equipped with directional relays. The relays trip the protector whenever power flows from the low voltage to the high voltage terminals of the transformer. It does not trip for power flow in the opposite direction. Automatic reclosing is provided.

The required reserve capacity in primary cables and transformers is not greatly different than that for the secondary selective circuits. Loss of voltage on one primary feeder immediately results in automatic transfer of the load previously carried by that feeder to adjacent load centers by way of the interconnecting low tension tie circuits. Reserve transformer capacity is needed to avoid transformer loading levels in excess of 125% of rating. Two primary feeders, to which the load centers are alternatively connected would require that the normal load level per transformer be held to 63% of rating. The required transformer capacity may be reduced by about 30% by the use of three or more primary feeders. This can also be accomplished in two feeder systems by the introduction of primary transfer switches in combination with suitable means for insuring prompt transfer of load center units to healthy feeders following loss of voltage on one feeder. Transfer devices offer no economic advantage over three feeder systems, hence are not considered because of the hazard of transfer switches.

It will be immediately apparent that the introduction of permanently connected emergency tie circuits will increase the low tension short circuit current level unless the size of load center units is simultaneously reduced. Where a number of load center units are interconnected on the low tension side, careful design and specification of tie circuit impedance will be necessary to realize the most favorable economic balance. It will quite often be necessary to insert reactors in the tie circuits to obtain the desired results. The same care in system design is required in incorporating one or more additional load center units in the network at a future date as dictated by future load conditions.

The installed cost of the secondary network referred to the simple radial type will be in the range of 175% to 200%. The increased cost is the result of the introduction of low tension tie circuits

A BOOK EVERYONE SELLING ST. LOUIS SHOULD HAVE!

FREE... 24 pages of essential market data

Never before, in one pocket-size book, so much up-to-date, helpful market data on St. Louis. Gives you actual comparisons between St. Louis and other principal markets with which you are familiar.

Twenty-four pages, packed with vital information on retail, wholesale and manufacturing businesses. A must for anyone selling St. Louis.

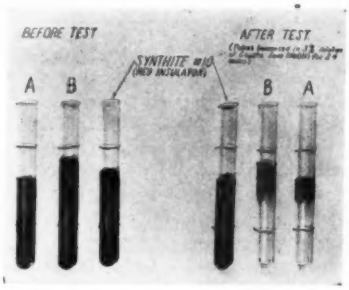
Write on your business letterhead for your free copy today. Address: Hotel Mayfair, 844 St. Charles St., St. Louis, Mo.

P.S. You'll really enjoy a stop at Hotel Mayfair. Nationally famous for friendly, efficient hospitality, good food and real comfort. And downtown St. Louis is right at your doorstep!

Over 50% of rooms, $3.50 or less, single; $5.00 or less, double.

hotel Mayfair St. Louis

Here's Proof— You can protect Motors Against Corrosives!



This test was run to determine the caustic resistance of DOLPH'S SYNTHITE No. 10 Red Insulator and two other red oilproof enamels. One coat of each enamel tested was applied to a glass tube, the tubes baked and immersed in a 3% caustic solution for 24 hours. Two enamels broke down completely—their film eaten away by caustic.

SYNTHITE No. 10 did not show signs of deterioration but adhered tightly to the glass, retaining its high gloss.

SYNTHITE No. 10 also offers maximum resistance to acids, oil and water. It may be brushed or sprayed, dries quickly and is recommended for use on rigid motor windings, commutator end bars, or for any interior or exterior use when a tough, high gloss, red finish is desired.

Write today for further information.

Dolph's **JOHN C. DOLPH COMPANY**
Insulating Varnish Specialists
166 EMMETT ST. NEWARK, N. J.

NALCO

Infra-Red Ray Lamps

For Radiant Energy - Drying

Standardize on Nalco Dritherm, *Carbon Filament* Lamps . . . available in Inside - Silvered or Clear Glass types.

Write for descriptive literature.

North American Electric Lamp Co.
1041 TYLER STREET ST. LOUIS, MISSOURI

NALCO ST. LOUIS INFRA-RED DRITHERM

There's No Inventory Problem!

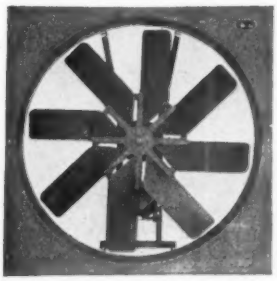
WITH **CHROMALOX**
REPLACEMENT
RANGE UNITS

Keep a few of these units in your service truck. At every call you make, for any reason, check on the electric range. When you find a lifeless unit, suggest immediate replacement with a Chromalox. No large stock needed —they fit all ranges.

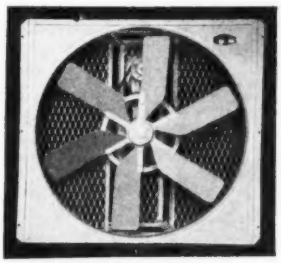
ATLANTA, Ga.—C. B. Rogers, 1000 Peachtree St. DALLAS, Texas—L. R. Ward, 403 Southland Bldg. Annex. RALEIGH, N. C.—W. R. Phillips.
EDWIN L. WIEGAND CO., 7600 Thomas Blvd., Pittsburgh, Pa.

Expand Your Field
Help Your Nation
Through Coolair
TRADE MARK

HERE'S your chance to benefit your nation and yourself by contributing to the greatest war effort in history. Speed is the key-note. You can help manufacturers and plant managers of supply units in your area by promoting greater employee efficiency — faster production through proper ventilating and cooling of offices and factories. Introduce Coolair's scientific Breeze-conditioning. It's already at work in factories throughout the country . . . already established as a necessity.



Hundreds of opportunities are now open for you to sell Coolair's improved Commercial and Industrial Exhaust Fans to these manufacturers and to civil necessity prospects such as laundries, bakeries, restaurants, recreation halls and hotels.



28-W WINDOW FAN—New, improved. Easily mounted in any standard window. No interference with window operation. Attractive ivory safety guard, sound-absorbing springs, reversing plug. For defense housing, offices and all smaller type installations.

TYPE O - 26 to 62 Inches —Ultra-quiet superior operation for stores, hospitals, laundries, restaurants, factories, theatres, offices, barber shops, garages. Type S - 6 to 9 feet is available for larger industrial and commercial installations.

Join the many other dealers all over the country who are now pushing Coolair Industrial and Commercial Exhaust Fans in this new field to take up the slack brought on by delayed deliveries and restricted items.

Clip the coupon below and mail right now and we'll send you this new Coolair Industrial Bulletin at once. It shows Coolair Fans at work and conveys an idea of what a great, growing opportunity this field holds for you!

MAIL THIS COUPON TODAY!

Please rush me the new Coolair Bulletin and dealership information.

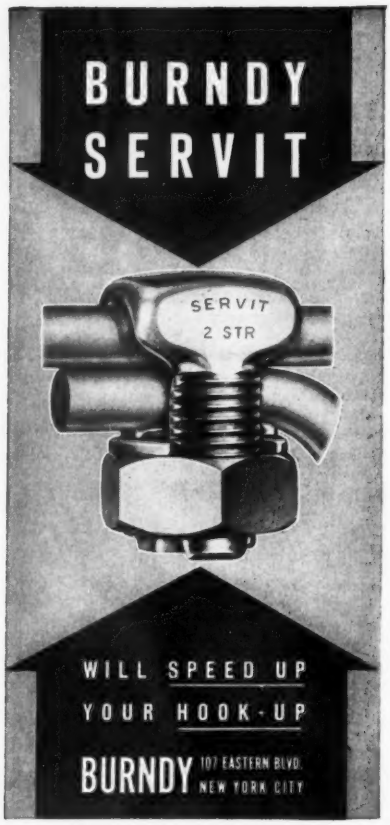
Name _____

Address _____

City _____

State _____

Coolair Ventilating and Cooling Systems
AMERICAN COOLAIR CORPORATION
Manufacturers . . . . JACKSONVILLE, FLORIDA



FROM DEFENSE TO Offense!
America must take the offensive . . . plants, depots, docks, yards, refineries, etc. need more light both for protection and production. Sell Revere—the complete line of Floodlights and Poles with valuable, exclusive construction features. Canvass all prospects in your territory.
3800 Series Porcelain Elliptor Floodlights, 300 to 1500 watts.
Revere DEFENSE LIGHT for ordnance plants, boundaries, areas, docks, refineries, etc.
4200 Series Rotating Enclosed-Type Floodlights, 750 to 1500 watts.
Hinged Floodlight Poles eliminate dangerous climbing. Floodlights can be cleaned at ground level.
Write for particulars.
REVERE ELECTRIC MFG. CO.
2919 NORTH PAULINA STREET · CHICAGO
Originators of the Hinged Floodlight Pole
INDOOR and OUTDOOR LIGHTING EQUIPMENT of EVERY DESCRIPTION

and the more costly low tension switching equipment demanded by increased short circuit current level.

With respect to safety, the secondary network, with low tension circuit breakers of adequate interruping capacity, is comparable with the secondary selective, and the simple radial types. The fact that more than one source circuit must be opened to deenergize a particular load center low tension bus represents some additional hazard, unless highly trained personnel is available.

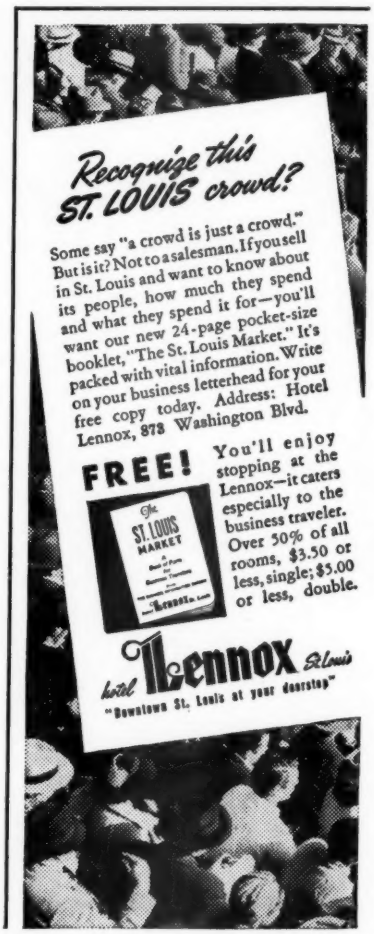
The increased low tension short circuit level to be expected with the secondary network is opposed to the interests of safety. Higher short circuit current levels means more violent disruptive effects at the point of fault. It may also jeopardize the safety of nearby branch circuit switching units and individual load controllers unless the system is carefully checked and designed to void such a possibility.

Service reliability is of the highest order to the load center low tension bus. A primary feeder or transformer unit may be deenergized without incurring interruption of service to any load center. Electrical faults in primary feeders or transformers will be automatically removed without service interruption except for a momentary voltage depression during the time the faulty element is being severed from the system.

Operating simplicity is sacrificed in the secondary network. In general any system incorporating multiple paralleled branches introduces operating complications. Should primary feeders originate from different high tension bus sections, as they should preferably do, voltage or phase angle differences between these two sources will cause circulating currents which increase the loading on some load center transformers and may create many perplexing problems for the operating departments. To deenergize a particular load center low tension bus requires that two or more source circuits be opened. The maintenance and adjustment of network protectors with their associated network relays require greater skill than do conventional air circuit breakers.

Voltage regulation is good but not significantly superior. The normal load regulation may be either above or below the secondary selective circuit depending on the particular form being considered. The regulation under emergency operation is likely to be inferior to the secondary selective form due to voltage drop in the low tension tie circuits.

It excels in the ability to accept heavy motor starting currents without light flicker which is directly the result of higher short circuit current levels. This feature will be of value, however, only if motor starting currents approach that value which will produce light flicker. For instance, across-the-line starting of a 5 hp motor on a 440-volt system having a short circuit current level of 25,000 amps. will result in a voltage drop of only 1%. Since this would be judged to represent no noticeable flicker effect even with incandescent lighting, an increase in short circuit current level could not be credited with improving light flicker. However, when larger motors are to be started, the network acquires some additional advantage.


Recognize this ST. LOUIS crowd?
Some say "a crowd is just a crowd." But is it? Not to a salesman. If you sell in St. Louis and want to know about its people, how much they spend and what they spend it for—you'll want our new 24-page pocket-size booklet, "The St. Louis Market." It's packed with vital information. Write on your business letterhead for your free copy today. Address: Hotel Lennox, 873 Washington Blvd.
FREE!
The ST. LOUIS MARKET
You'll enjoy stopping at the Lennox—it caters especially to the business traveler. Over 50% of all rooms, $3.50 or less, single; $5.00 or less, double.
hotel Lennox St. Louis
"Downtown St. Louis at your doorstep"

FREE

BULLETINS AND BOOKLETS ON SALES AND SERVICE

Through cooperation with leading manufacturers, E. S. makes it possible for you to secure the following Helpful Booklets, Reference Bulletins, Handbooks and Catalogs, without cost or obligation. Check the list, fill in the coupon and mail to ELECTRICAL SOUTH, *Grant Bldg., Atlanta, Ga.*

101. SERVICE EQUIPMENT AND LOAD CENTERS—Service Equipment, Load Centers and Panelboards assembled with Type AC circuit breakers are listed in this new publication. In addition to considerable general information, it includes specifications and price data. Frank Adam Electric Company, St. Louis, Mo.

105. COOLAIR HOME-COOLING FANS—FORM 141—Complete descriptions of 1941 Coolair single and twin attic fans, window fan and new automatic ceiling shutter. Also contains valuable installation suggestions. Designated as Form 141. American Coolair Corp., Jacksonville, Fla.

111. NEW CORY CATALOG—The new merchandising features presented in this new catalog are free spare glass with famous CORY Assortments—also the new CORY Glass Filter Rod-Funnel Holder Dollar Combination which makes these needful accessories available to all users of Glass Coffee Makers. Glass Coffee Brewer Corp., 325 No. Wells St., Chicago, Ill.

113. INTERPRETING THE NEW CODE IN TERMS OF NEW BUILDING WIRES—A new booklet describing the rulings on thin, heat-resisting and synthetic insulations are carefully simplified. The ratings of the newly recognized types of wires and the new ratings for Type R are graphically shown in tables for both the new and rewiring classes of work. General Cable Corporation, 420 Lexington Avenue, New York, N. Y.

114. IDEAL PRODUCTS CATALOG — A special 25th anniversary catalog has just been issued describing the complete line of Ideal Products. Electrical Contractors, Motor Rewinders, and Industrial Maintenance Electricians will be particularly interested in this comprehensive publication. Ideal Commutator Dresser Co., 1270 Park Avenue, Sycamore, Ill.

115. FLUORESCENT LIGHTING ACCESSORIES—Fall Bulletin No. 3, describing and illustrating complete Lloyd line of Fluorescent Lamp Holders, Starters, Starter Sockets and Holder and Socket combinations. Lloyd Products Company, Providence, R. I.

117. MECHANICAL CONNECTORS—First Aid for electrical systems through the use of mechanical connectors is the subject of an interesting twenty-page booklet now available. In addition to specific construction and sales of the new "Gorilla Grip," this booklet describes a wide range of mechanical connectors for every size and purpose. National Electric Products Corp., Pittsburgh, Pa.

120. SQUARE D COMPANY announces the Spring issue of the Square D Digest, dated April, 1941. This condensed catalog contains listings and the latest prices of many Square D products, including Safety Switches, Service Equipment, Multi-breakers and other Circuit Breakers, Panelboards, Motor Control and Pressure Switches. Square D Co., Detroit, Michigan.

129. BULLETIN 403 on BullDog enclosed bus bar system of electrical distribution for commercial and industrial use. Forty-four pages of construction details, applications, dimensional data and technical charts. BullDog Electric Products Co., 7610 Jos. Campau, Ave., Detroit, Mich.

132. INDUSTRIAL WIRING HANDBOOK: This 48-page handbook, called "Adequate Wiring for Industry," describes modern factory wiring methods and materials. Wiring practices adaptable to all factories are outlined. Publ No. 51-4011. General Electric Co., Appliance and Merchandise Dept., Bridgeport, Conn.

142. ELECTRICAL CONDUIT: Complete technical information on corrosion-resisting asbestos-cement ducts for underground and overhead service, with and without concrete envelop, is included in "Transite Conduit and Korduct for the Electrical Industry." DS Series 410. Johns-Manville, 22 East 40th Street, New York, N. Y.

144. UNIVERSAL ELECTRIC RANGES—Complete line folder giving features of models in Universal 1941 line of electric ranges and telling "Precision Cooking" story. Folder No. 6420. Landers, Frary & Clark, New Britain, Conn.

148. LITTLE GIANT RELAY—A new small Relay for use on A. C. or D. C. is described in a Ward Leonard Bulletin No. 105. The Relay is available in single pole, single or double throw contacts. On standard frequencies, coils can be obtained for 6 to 230 volts. Complete information on contact rating is given in the bulletin. Ward Leonard Electric Co., Mount Vernon, N. Y.

149. ELECTRIC RANGE UNITS: Chromalox Bulletin CF-107 lists proper assembly and adaptor ring to fit any range, regardless of age or make. Inventory investment and servicing reduced to minimum. Units same as used on many makes of new ranges. Edwin L. Wiegand Company, 7600 Thomas Boulevard, Pittsburgh, Pa.

155. ELECTRICAL CONNECTORS — 32S page catalog describing and illustrating Burndy clamp connectors for overhead distribution and transmission, substations, grounding, underground distribution and industrial wiring. Contains 84 pages of useful technical information. Company asks that requests for the catalog, Catalog No. 40, be written on company letterhead. Burndy Engineering Co., Inc., 107 Eastern Blvd., New York City.

156. INTERVAL AND PROCESS TIMERS—Furnished for any cycle of time, fully adjustable, for any purpose, any requirement, or any specified action. Each one built to meet individual specifications. Give information regarding what unit is to be used on, what it is to be used for, and what it is expected to do. Both Manual and Automatic Reset types available; individual or repeatingly continuous operation. Automatic Elec. Mfg. Co., Mankato, Minnesota.

157. PROGRAM OR SIGNAL TIMERS—Used extensively for starting and stopping working hours, marking the beginning and ending of school class periods, sounding municipal time signals, and so on. Write for descriptive circular. Automatic Elec. Mfg. Co., Mankato, Minnesota.

158. ELECTRIC MOTOR REBUILDING MATERIALS CATALOG—28 pages—gives complete descriptions, specifications and prices on all materials and replacement parts necessary for the electric motor rebuilding shop. Insulation & Wires, Inc., 2127 Pine St., St. Louis, Mo.

159. NEW COMPLETE FLUORESCENT CATALOG NO. 114—Lists in detail fixtures for every type of lighting application. New units abound in this book which is sure to be welcomed as the complete story on fluorescent by architects, contractors and jobbers alike. Day-Brite Lighting, Inc., St. Louis, Mo.

160. ELECTRICAL CONNECTORS—Complete up-to-date catalog of Handy Electrical Connectors and devices for repair, maintenance and new construction. Ask for publication Z-103. H. B. Sherman Mfg. Co., Battle Creek, Michigan.

161. RECTIFIED FLUORESCENT LAMPS AND LUMINAIRES—A recent booklet describing RF lighting especially designed for industrial lighting needs. Illumination layout data and illumination tables illustrate this booklet. Lamp Department, General Elec. Co., Nela Park, Cleveland, Ohio.

162. INDUSTRIAL TIMERS—New bulletin giving complete construction and operating data on synchronous motor-operated, manual reset Industrial Timers to time and control scores of manufacturing operations. Paragon Elec. Co., 409 S. Dearborn St., Chicago, Ill.

163. TIME CONTROL DEVICES — Engineering data on automatic reset timers and Time Delay Relays suitable to control hundreds of industrial operations. Numerous specific applications described. Paragon Elec Co., 409 S. Dearborn St., Chicago, Ill.

164. INSULATING VARNISHES AND COMPOUNDS—40-page catalog assists in selection of the right insulating varnish or compound to meet any specific requirement. Contains helpful temperature conversion and tank capacity tables. Lists and describes all standard grades of DOLPH air drying and baking insulating varnishes and compounds. John C. Dolph Company, 166 Emmett St., Newark, New Jersey.

165. TECHNICAL DATA ON J-M TRANSITE ASBESTOS-CEMENT ELECTRICAL DUCTS—including installation and special fitting data on J-M Transite Electrical Conduit and Korduct—a bound set of technical data sheets on the two asbestos-cement duct materials. Primarily prepared for designing engineer and installation supervisor, the 42-page book is chuck-full of practical information for anyone concerned with underground or overhead duct installations. Tables giving dimensions of ducts and fittings and numerous installation photographs are included. Copies of the book, Form DS Series 410, may be obtained upon request to Johns-Manville, 22 East 40th St., New York City.

Please send to me without obligation, free booklets No. ..... described in the February 1942 issue of ELECTRICAL SOUTH.

Name .....

Company ..... Position .....

Number and Street .....

City ..... State .....

Tear out and mail to ELECTRICAL SOUTH, Grant Building, Atlanta, Georgia.

ADVERTISER'S INDEX

The Advertisers' Index is published as a convenience, and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A

Adam Electric Co., Frank 5
Aluminum Co. of America 49
American Coolair Corp. 61
American Red Cross 51
American Steel & Wire Co. ..... *
Anaconda Wire & Cable Co. 6
Arrow-Hart & Hegeman Electric Co. ..... *
Asplundh Tree Expert Co. 60
Automatic Electric Mfg. Co. ..... *

B

Briegel Method Tool Co. 56
Bull Dog Electric Products Co. 43
Burndy Engineering Co., Inc. 62

C

Colt's Patent Fire Arms Mfg. Co. ..... *
Columbia Steel Co. ..... *
Cory Glass Coffee Brewer Co. ..... *
Couch Co., Inc., S. H. ..... *
Crescent Insulated Wire & Cable Co., Inc. ..... *

D

Day-Brite Lighting, Inc. ..... *
Dolph Co., John C. 61

E

Edison General Electric Appliance Co. ..... *

G

General Cable Co. ..... *
General Electric Co. (Fans) 2
General Electric Co. (Insulating Materials) 53
General Electric Co. (Lamps) ..... *
General Electric Co. (Wiring Materials) ..... Back Cover
Globe Lighting Fixture Mfg. Co. 59
Graybar Electric Co. ..... *
Greenlee Tool Company 58

H

Hazard Insulated Wire Works 1
Hotel Hollenden 57
Hotel Lennox 62
Hotel Mayfair 60
Hubbard & Company ..... *
Hunter Fan & Ventilating Co., Inc. ..... Front Cover
Hygrade Sylvania Corp ..... Inside Front Cover

I

Ideal Commutator Dresser Co. 60
Illinois Electric Porcelain Co. ..... *
Insulation & Wires, Inc. 57

J

Johns-Manville ..... 3 and 4

L

Landers, Frary & Clark ..... *
Lloyd Products Co. 8

M

Mitchell Mfg. Co. ..... *

N

National Electric Products Corp. 52
North American Electric Lamp Co. 61

O

Okonite Company 1

P

Paragon Electric Co. 57
Porcelain Products, Inc. 45
Progress Mfg. Co., Inc. ..... Inside Back Cover

R

Revere Electric Mfg. Co. 62
Robbins & Myers, Inc. 55
Rogers, C. B. ..... *

S

Sangamo Electric Co. ..... *
Sherman Mfg. Co., H. B. 54
Signal Electric Mfg. Co. 57
Silex Company ..... *
Square D Company ..... *

U

United States Steel Co. ..... *

W

Ward Leonard Electric Co. 59
Westinghouse Elec. & Mfg. Co. (Full Line) 47
Westinghouse Elec. & Mfg. Co. (Safety Switches) ..... *
Wiegand Co., Edwin L. 61
Wiremold Company ..... *

Y

Youngstown Sheet & Tube Co. ..... *

60
*
57

4

*
8

*

52
61

1

57
45
ver

62
55
*

*

54
57
*
*

*

59
47
*
61
*

*

942